FORESTRY ABSTRACTS

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THE PRETREATMENT OF FOREST SEED TO HASTEN GERMINATION

(concluded)

3. *Chemical Treatments.*

Since the early experiments of Pfeil [90] and Vonhausen [98] on conifers, with their 'chlor' and 'kalkwasser' and certain acids, an immense variety of chemical compounds has been pressed into service in attempts to stimulate tree-seed germination. The results have been disproportionately meagre except in the case of a few mineral acids, notably sulphuric acid, and the lowest alcohols, especially ethyl alcohol.

3·1 *Acids.*

The use of acids, particularly the more corrosive, to reduce and render permeable 'hard'-coated types of seed suggested itself early. As pointed out by Berkeley [75], sulphuric acid, generally in concentrated form, was long used by the old Bihar planters to hasten the germination of *Indigofera arrecta*, and, since 1890, for many kinds of agricultural legumes everywhere. It has subsequently become the most widely used and successful acid for tree seeds, at least in the simple types of dormancy, with optimum soaking periods varying from minutes to many hours, according to species. Thornber, an early American experimenter [94] reported stimulation of *Acacia* and *Prosopis* species and also of *Robinia pseudoacacia* after brief immersion in concentrated H_2SO_4. Subsequent workers, repeating and elaborating on his treatment for *Robinia*, in view of the growing importance of this species for soil protection, have in general confirmed his results [cf. 1, 47, 61 and 84]. Burton, in the study already referred to [8], found the seed of Idaho origin more resistant than the Austrian; a soaking period that stimulated the former proved fatal to the latter, a pointer to the risks and difficulties involved in the acid treatment of highly variable seed. In general, the margin of error appears to be much less than with water, particularly in terms of temperature and time of soaking. Meginnis, nevertheless, in his comprehensive investigation [41] demonstrated the practicability of large-scale acid treatment and its advantages over hot-water soaking [cf. 69] inasmuch as the seed can be more easily sown and will keep for some time after treatment without loss of viability. Steeping in cold concentrated H_2SO_4 for periods up to 2 hours, according to type of seed (testa) and the day-to-day temperature, followed by some 10 minutes' washing, gave field germinations averaging from 1·7 to 14·6 times that of untreated seed and comparing favourably with the best machine scarification [cf. 23 and 47]. Warmer weather made it necessary to reduce the period of acid soaking, while the great variability of seed lots in respect of structure and permeability of the outer coats rendered periodic test treatments advisable.

Other Leguminosae on record as successfully stimulated by concentrated H_2SO_4 are eleven *Acacia* species, including *A. arabica* and *mollis* [17], three *Cassia* [31], especially *C. siamea* (germination period reduced from 60 to 10 days by only 10 minutes' soaking) [96] and *Albizzia acle* [16], for which Delizo found 1 hour's immersion in concentrated H_2SO_4 better than scarification: a result recently paralleled by Gindel [23] for *Calycotome villosa* (85% germination for acid versus 50% for scarification in 28 days). Gindel also reported marked stimulation of *Ceratonia siliqua* and especially of *Gleditsia triacanthos* [cf. 74] but with both these species scarification gave even better results than the acid. Either of these treatments is recommended for *G. triacanthos* in Dutch nursery practice [43].

For *C. siliqua* Gindel found that two hours' acid soaking followed by 1-2 days' cold-water immersion gave dramatic stimulation, 94 to 97% germinating in three days, while only 10% of the controls had germinated after 31 days.

Of the few other hardwoods experimented with, *Santalum album* [3] and a variety of Japanese species [64] were harmed and not stimulated by H_2SO_4; but a 6-8 hours' soaking of *Pistacia atlantica* gave 44-50% germination in 54 days, versus 8% for controls, whereas cold-water soaking and scarification were ineffectual [23]. As regards species of complex dormancy, Spaeth, in his intensive study of *Tilia americana*, effectively demonstrated that only 10 minutes' immersion of the extracted seed in concentrated H_2SO_4 sufficed to render all seed coats permeable, although this of itself could not induce germination. Microscopic examination showed the acid to have removed all tissue up to the 'light line' in the Malpighian palisade cells. Similar treatment, preparatory to stratification, was found best for *Cercis canadensis* by Afanasiev [2].

Among the few conifer species tried with H_2SO_4, successful stimulation is reported for *Pinus lambertiana* [cf. 92 and 32] and for *P. monticola* [40] and successful permeation—preparatory to stratifying—for *P. cembra* (cf. *Tilia americana* and *Cercis canadensis* above). Olson, employing diluted H_2SO_4 as a fungicide, at the rate of $\frac{3}{16}$ oz. commercial H_2SO_4 in $\frac{3}{16}$ gallon H_2O per square foot of seedbed, reported that it hastened germination of both *Pinus ponderosa* and *P. monticola*; the application, made within 24 hours after sowing, was followed within two days by a thorough water sprinkling [89, cf. 83].

Of numerous other acids tried, hydrochloric has chief claim to notice. Lindgren, over 80 years ago [86], had some success with soaking old tree seed in weak HCl for 2 days and then sowing immediately, as an alternative to stratification over winter. Holten recently found that dilute HCl (24 hours' soaking at pH 4·2 to 6·0) hastened the germination of Douglas Fir when water soaking failed, and was a superior hastener to water for Scots Pine and, in particular, Norway Spruce [26]. On a less practical plane HCl, along with certain other dilute acids, has been observed to accelerate the after-ripening of excised embryos of *Crataegus* spp. [81]. As regards other acids, Larsen found that acetic, citric and carbolic acids all stimulated *Pinus monticola* but to a much less degree than H_2SO_4 [40].

Many workers have noted that acid treatment has an advantage over water soaking in that seed can be kept for some considerable time afterwards, a finding paralleled by agriculturists with, for example, red clover and cotton seed. Holten (above) got much better survival from his acid-treated Spruce seed when dry weather followed sowing. Barton recorded 92% germination of 'hard' *Gleditsia triacanthos* seed, tested 46 weeks after a 2-hour soaking in concentrated H_2SO_4 [74]. Meginnis found no diminution of viability of treated *Robinia pseudoacacia* after keeping it for one month, and indications that even one year's storage would not reduce the plant per cent. by more than 30%. Tests by Taylor corroborate this. Seed treated a year before and kept in closed containers at room temperature, germinated just as well as freshly treated seed. *Gleditsia triacanthos* retained most of its initial viability for several years [61]. There is general agreement, however, that seed should be dry before, and thoroughly washed after, its acid bath, and of course, as thoroughly dried again if not sown immediately. Contact with acid of even low concentration may be fatal to the emerging radicle, as demonstrated during Hartley's experiments in disinfecting nursery seedbeds sown with Pines; volume for volume, sulphuric acid proved much more toxic to germinating seeds than either nitric or hydrochloric acid [83]. Its application required very careful timing.

The various practical details of concentrated-H_2SO_4 treatment are described by a number of workers [cf., for example, 1 and 41]. Recommendations for the acid/seed volume ratio vary from 1–1·5:1 [74] to 3–10:1 [1].

3·2 *Other Chemicals.*

Although many groups of compounds, ranging from salts of metals and bases to plant hormones and vitamins have been reported to stimulate various agricultural seeds under certain circumstances, successes of practical significance with tree seed are few and somewhat sporadic. They are practically confined, moreover, to species of simple and mild dormancy [cf., for example, 33 with 21 and 58] where the more familiar reagents act equally well or better.

Among organic solvents a few of the lower alcohols, in particular absolute ethyl alcohol, have been found effective on many kinds of 'hard' seed, playing the same rôle as acids, but infiltrating where the latter merely carbonize. Crocker [77] first noticed this with *Prosopis juliflora*. Verschaffelt, another pioneer in this field, reported rapid imbibition of water by numerous resistant Leguminosae, including *Gleditsia triacanthos*, *G. japonica*, *Ceratonia siliqua* and *Cercis siliquastrum*, following immersion for 2–3 hours in 95–100% ethyl alcohol and also methyl alcohol, concentrations lower than 80% proving useless [97]. Less responsive were *Cassia fistula*, *Acacia arabica*, *Prosopis juliflora*, *Poinciana regia* and *Gymnocladus canadensis*, while the higher alcohols proved successively less efficacious. *Robinia pseudoacacia* remained impervious to any alcohol treatment—a finding later to be confirmed by Barton. Ether, chloroform and benzol were ineffective on all species. Verschaffelt concluded that, in most cases, the alcohol acted, not by extracting materials that rendered the testa impermeable but rather by penetrating minute fissures which water could not enter unless the alcohol had preceded it. Recent work by Barton [7], already cited under scarification, indicates that the Leguminosae react differently to permeation treatments according to sub-family and leaves the whole mechanism of impermeability still an open question. Seeds of various Caesalpinioideae, including *Gleditsia triacanthos*, remained impervious after abrasion by shaking but became permeable following 72 hours' immersion in absolute ethyl alcohol at room temperature; whereas seeds of various Papilionoideae, including *Robinia pseudoacacia*, behaved in contrary fashion. The Mimosoideae appeared to occupy an intermediate position; within the genus *Acacia*, for example, some, like *A. constricta*, reacted well to alcohol and little to shaking, others, like *A. aneura* and *A. hakeoides*, the reverse, while *A. greggii* responded 100% to both.

McKeever, trying various solvents on *Robinia pseudoacacia*, found xylene, ether and acetone to be the most effective, in that order, his success with ether being at variance with Verschaffelt's experience. Soaking for 10, 30, 60 and 120 minutes in these, gave accelerated germination equal to and, for the longer soakings, surpassing that of 95° C. hot-water treatment and nearly as good as scarification [88]. Crocker, nearly 30 years before, had found ether as effective as alcohol on *Prosopis juliflora*. But with species of complex dormancy like *Cercis canadensis* and *Tilia americana*, neither ether nor alcohol treatment has proved of itself efficacious [2, 58]. Of parallel interest are Shear and Crane's use of 'penetrants' to hasten the germination of Tung (*Aleurites fordii*). After 48 hours' immersion in 1% morpholine, seeds that ordinarily took some 60 days to sprout in the nursery were hastened by 12–18 days as compared with water-soaked seed and 16–30 days as compared with controls. Tergetol, however, proved too toxic, reducing the germination per cent. heavily [91]. The varying, though often remarkable, success that has attended experiments to break the dormancy of buds, tubers and roots of plants with various organic substances and ethylene compounds has by no means been paralleled with seed, and workers with forest seeds have been few. Deuber, however, using ethylene chlorhydrin, reported considerable stimulation of Norway and Sugar Maples (1 minute in 3 and 6% solutions) and of Black and Red Oaks (24 hours in vapour) [79]; so, too, Johnson (1·5% solution) with *Larix decidua* [33]. But Trist, and later Spaeth, found it useless with the complexly dormant *Tilia americana* [95, 58]. Deuber also stimulated Black Oak by putting the acorns in a complete atmosphere of commercial illuminating gas for periods from 6 hours to 4 days. Red Oak germination, however, was somewhat retarded [80]. Spaeth found the gas useless with *Tilia americana* seed and retardant to the freed hypocotyls [58].

The following are also worth brief mention:—

(1) *Hydrogen peroxide*. Concentrated H_2O_2, frequently negative or retardant in agricultural experience [cf. 87], has been little tried on forest seed. Pack found it quite ineffective on several species of American Junipers of complex dormancy [45]. Solutions up to 1% have proved slightly stimulating on *Liriodendron tulipifera* [22].

(2) *Thiourea*. Such little experimentation as has been done carries no great promise, despite certain successes with agricultural seed, e.g. lettuce [93]. Deuber reported hastening of Norway and Sugar Maple after 1 minute's immersion in a 3% solution, and, to a less extent, of Black and Red Oak after 15 minutes [79]. So too Johnson, recently [33], for *Betula lutea*, *Larix decidua* and two *Picea* species (1 minute in 1·5% solution). Trist, who had failed with ethylene chlorhydrin

and sodium thiocyanate on *Tilia americana*, obtained a maximum germination of 4·5% after 40 days from seed soaked 70 minutes in 4% thiourea [95]. Flemion, however, found it useless with *Sorbus aucuparia* [21, 82].

(3) *Liquid nitrogen* (−320° F.), which Barton tried successfully on impermeable seeds of *Melilotus alba*, employing four 30-second dips alternating with a plunge into water, failed completely with *Gleditsia triacanthos* even when immersion was extended to 15 minutes, a further indication that impermeability is a complex phenomenon [7].

4. *Miscellaneous.*

Here may be noticed a few methods, not classifiable under any of the preceding heads and of interest rather than any practical value. Several workers, chiefly with non-forest species, e.g. [99] and [78] have hastened germination by forcing water into seeds under high pressure. Davies used pressures up to 2,000 atmospheres. Flemion [82], however, found as much as 5 tons per square inch ineffective on *Sorbus aucuparia*. Various forms of electricity and short-wave radiation have also been experimented with sporadically. These have so far proved even less stimulating to forest seed, with their generally thicker coats, than to agricultural seed. Jacobs, using high-voltage static electricity, failed with *Pinus lambertiana* [32], as did Flemion, using ultra-violet and various electrical stimuli on *Sorbus aucuparia* [82]. About the same time, Busse and Daniels demonstrated that cathode rays ($\frac{1}{2}$ to 3 minute exposures) rendered the 'hard' testas of various agricultural species highly permeable to water, but at the cost of injury and dwarfed development. X-rays had similar effects but required at least several hours' exposure [76, cf. 72]. Johnson, however, found no stimulation from X-rays [85] nor did Spaeth [58] nor did Baldwin with (dry) seed of various Pines, including *P. sylvestris* and *strobus*; in nearly every case germination was actually retarded [73].

To sum up, so far as the complexity of the subject permits of generalizations, the following conclusions seem justifiable:—

1. Except for certain 'dry-flesh' fruits, seeds should be de-pulped, even if they are to have no other hastening treatment; they are probably better washed as well. Soaking the pulp before removal appears to have no particular virtue.

2. Where dormancy is due simply to an impermeable or mechanically resistant seed coat, the forester can reduce it by several methods—mechanical scarification, water, concentrated H_2SO_4 or ethyl alcohol. These are not necessarily alternative; one method may succeed where another fails, as in certain of the Leguminosae. Impermeability is a complex phenomenon, requiring further study.

3. Scarification invites fungus attack, may not be practicable on fruits having a tough pericarp (e.g. *Tilia* spp.) and requires special machines for large-scale working. It is, however, quick and simple to organize and operate, and where skilled operation minimizes wastage of seed, inexpensive; scarified seeds store poorly but can be mechanically sown.

4. Of the 'wet' methods, water is cheapest but slow, especially for hardwoods. Heating shortens the treatment (boiling needs skilled operation), but leaves less margin for error; so does concentrated acid, acting in hours instead of days, but it raises the cost, requires care in handling, and involves washing schedules. Alcohol is as quick but much more costly and in large-scale operations might require vigilance of a different sort. Water-treated seed does not lend itself to storage or mechanical sowing; alcohol treatment, in so far as it precedes water treatment, carries the same disadvantages; acid-treated seed can both be stored and machine-sown.

5. Where dormancy is embryonic or, as so commonly, complex, low-temperature stratification is called for, combined with one of the above treatments wherever the seed coat contributes materially to dormancy. A *constant* temperature of the order 2 to 8° C., maintained for one to several months, appears most effective but specific schedules need to be worked out. The possibilities of natural stratification, for example in outdoor snow trenches, merit further study.

6. Electrical and radiation treatments appear to carry no promise. F. R.

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(Reprints of the above article are available from Central Sales Branch, Aberystwyth, at 2/- each.)

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in other languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

02. TEXTBOOKS. DICTIONARIES

[1530]. 02.1 (51). HAO, T. S. **General forestry.** Commercial Press, Shanghai. 1946. pp. 10 + 2 + 303. Numerous refs. [Chin.]

A textbook in 6 parts—(1) General; (2) Ecology, botany and zoology; (3) Silviculture, protection and parks; (4) Utilization, including logging, wood anatomy, preservation; (5) Management, economics and mensuration; (6) (*a*) Chinese forest history; (*b*) Chinese forest law; (*c*) Chinese forest policy.

06. CONFERENCES. PROPAGANDA

See also *For. Abstr.* 10 (Nos. 1710–1).

[1531]. 06.2 (675). Comptes rendus de la semaine agricole de Yangambi (du 26 février au 5 mars 1947). **[Proceedings of the Yangambi agricultural week (26 Feb.–5 March 1947).]** *Publ. Inst. nat. Étude agron. Congo Belge (hors série)* 2 vols., 1947. pp. 952 + maps + tbls. [F.]

[1532]. 06.2 (803). **The Latin-American conference on forestry and forest products, Teresopolis, 1948.** *Unasylva* 2 (3), 1948 (94–110).

General account, list of delegates and representatives, and resolutions.

[1533]. 06.2 (97) : 12.21. DENNIS, R. W. G. **Commonwealth Mycological Conference.** *Research* 1 (12), 1948 (548–52). 17 refs.

Report on the conference, with brief résumés of some of the papers and discussions.

[1534]. 06.6 (471) : 06.1. VESTERINEN, E. Metsätaloudellinen Valistustoimisto 20v. **[A retrospect of the work of the Forestry Information Bureau, on the occasion of its 20th anniversary.]** *Metsät. Aikak.* 1947 (4), (99–100). [Fi.]

A retrospect of the activities of the Forestry Information Bureau of the Finnish Forestry Association, founded in 1927 to interest the public, schools etc. in forestry as a national industry. The Bureau started its work in May, 1927. During its first 20 years it provided the press with 3,300 feature articles and collected some 4,000 pictures illustrating forests and forestry, copies of which were distributed to printers and publishers, to authors of school books, foreign delegations, and through the Foreign Ministry and the Finnish Legations to people interested abroad. The Bureau has collaborated in the production of 2 films illustrating the forestry and woodworking industries of Finland. Lectures have been provided for the Finnish radio and for agricultural and industrial exhibitions. The Bureau has also run an annual Forestry Week, with forestry lessons in schools, for soldiers, etc. Apart from a small State subsidy, the Bureau has derived its funds from contributions from the woodworking industries and banks, and from endowments.

07. EDUCATION AND RESEARCH

See also *For. Abstr.* 10 (Nos. 1561, 1833–4).

[1535]. 07.1 (438). MUNNS, E. N. **Forest education in Poland, 1947.** *J. For.* 46 (9), 1948 (679–82).

[1536]. 07.1 (45) : 91.8. MESCHINO, A. I cantieri di rimboschimento e di bonifica del piano Fanfani. **[Training centres for the unemployed in connexion with reforestation and land improvement under the Fanfani plan.]** *Ital. for. mont.* 3 (4), 1948 (225–9). [It.]

[1537]. 07.1 (803). **Training of personnel [for forestry in Latin America].** *Unasylva* 2 (3), 1948 (123–4).

Recommends the establishment of a Latin-American Forestry Institute, to supplement the existing inadequate arrangements.

[1538]. 07.2 (437). Šulc, J. Organisační vyvoj a pracovní výsledky státního lesnického výzkumnictví v Československé republice. **[Organizational development and working results of State forestry research in Czechoslovakia.]** *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (3–30). [Cz.e.russ.]

Briefly reviews the pre-war history and organization of Czechoslovak forest research institutions, with an account of post-war extensions (still in progress) and activities. The present organization provides for new Institutes of: Logging and Wood Technology, Forest Engineering and Soil Conservation, and Dendrology and Geobotany, all at Prague; Forest Survey and Photogrammetry, at Brno; and Silviculture and Forest Biology, at Banská Štiavnica.

[1539]. 07.2 (54). **The Forest Research Institute and Colleges [Dehra Dun]—its scope and functions.** Ministry of Agriculture, Government of India. [1948?] pp. [ii] + 21 + 19 plates.

[1540]. 07.6 (494). **Description of the demonstration forest of the School of Forestry [Zürich].** Swiss Federal Institute of Technology, Zürich. 1947. pp. [9]. [E.]

[1541]. 07.6 (678). Fernie, L. M. **The Amani plantations.** *E. Afr. agric. J.* 14 (2), 1948 (86–93). 3 refs.

09.1. *Forest History*

See also *For. Abstr.* 10 (Nos. 2346, 2371).

[1542]. 09.1 (431–5) : 09.4 : 98. Wiedemann, E. Die Entwicklung des Waldes der britischen Zone, dargestellt am Beispiel von Niedersachsen. **[The recent history of the forests of the British Zone of Germany, as illustrated by [the State forests of] Lower Saxony.]** *Z. Weltforstwirt.* 12 (1/3), 1948 (12–18). [G.e.f.]

Cf. *For. Abstr.* 8 (No. 2249).

[1543]. 09.1 (494) : 90 : 8. Weisz, L. Forstpolitik und Forstverwaltung in der Helvetik. **[Forest policy and forest administration in the [period of the] Helvetic Republic.]** *Schweiz. Z. Forstw.* 99 (4; 5), 1948 (187–211; 242–69). Many refs. [G.f.]

[1544]. 09.1 (494) : 92. Grossmann, H. Forstgesetzgebung und Forstwirtschaft in der ersten Hälfte des 19. Jahrhunderts, 1803–1848. **[Forest legislation and forestry [in Switzerland] in the first half of the 19th century, 1803–48.]** *Schweiz. Z. Forstw.* 99 (7), 1948 (379–93). [G.f.]

[1545]. 09.1 (494) : 81. Petitmermet, M. L'Inspection fédérale des forêts, son histoire. **[The Swiss Federal Inspectorate of Forests: its history.]** *Schweiz. Z. Forstw.* 99 (8), 1948 (417–28). [F.g.]

[1546]. 09.1 (51) : 05.3. **Annual report of the forestry department of Hong Kong for the year 1946–47.** [? Forestry Department, Hong Kong.] [?1948.] pp. 11.

Includes a brief review of forest history and résumé of the work of the past 10 years.

09.4. *Forest Statistics*

See also *For. Abstr.* 10 (Nos. 1542, 2146, 2193–8, 2347, 2375).

[1547]. 09.4 : 01.2 : 01.3. **The work of FAO: forestry and forest products statistics.** *Unasylva* 2 (3), 1948 (138–44).

A brief account of such attempts as have hitherto been made to compile international forestry statistics and the future compilations proposed by FAO. A list is given of classifications and definitions that have been approved for international use:—(1) land classification, (2) growing stock of accessible productive forested land, (3) annual growth of forests and annual drain, (4) definitions of forest products.

[1548]. 09.4. **Forest resources of the world.** *Unasylva* 2 (4), 1948 (161–82).

A preliminary report on answers to the FAO Forest Inventory questionnaire. The definition of terms is first discussed in some detail. Answers have been received from 110 countries and non-self-governing territories. The most considerable gap in the information is that for the U.S.S.R., which has not replied. The following tables are printed and discussed: forested area; land classification; classification of productive forests (accessible, inaccessible, coniferous, broadleaved); ownership of productive forests; growing stock in accessible productive forests; average annual

growth and annual drain (all species, broad-leaved, and coniferous).

[1549]. 09.4 (4). Forststatistische Übersicht Europas. [**Conspectus of forest statistics for Europe.**] *Z. Weltforstwirt.* 12 (1/3), 1948 (53–5). [G.]

Consists of a table of the chief forest statistics, by countries and with totals for E. and W. Europe, plus a sketch-map showing by regions the percentage of land under forest.

[1550]. 09.4 (471) : 61.31 : 52.46. ILVESSALO, Y. Suomen metsävarat ja metsien tila. II valtakunnan metsien arviointi. [**The forest resources and the condition of the forests of Finland. The Second National Forest Survey.**] *Commun. Inst. for. Fenn.* 30, 1943 (1–446). [Fi.g.e.]

Cf. *For. Abstr.* 2 (182; 276).

[1551]. 09.4 (71). CANADA. **Estimate of forest production operations in the woods in Canada 1946.** Dominion Bureau of Statistics, Ottawa. 1948. pp. 14. [E.F.]

[1552]. 09.4 (71) : 98. **Amendment list: statistical record of the forests and forest industries of Canada.** Dominion Forest Service, Ottawa. 1948. pp. 2.

Cf. *For. Abstr.* 9 (No. 2025).

[1553]. 09.4 (803). **Forest resources of Latin America.** *Unasylva* 2 (3), 1948 (111–2).

An interim statement, including a table giving estimated production acreage (broad-leaved, coniferous, mixed) of each country at the present time.

[1554]. 09.4 (89) : 09.7 : 31.0. **Forest resources of Paraguay.** *Unasylva* 2 (3), 1948 (129–31). 4 refs.

A report presented to the Latin-America conference on forestry and forest products. Includes statistics of existing timber stands by departments and of production, and a list of the principal commercial timbers with density and modulus of rupture.

09.7. *Monographs of Individual Forest Regions*

See also *For. Abstr.* 10 (Nos. 1544, 2376).

[1555]. 09.7 (494). GROSSMANN, H. Die Wälder zwischen Zürichsee und Sihltal. [**The forests between the Lake of Zürich and the Sihltal.**] *Repr.* from *Jahrbuch 1946/7 des Verbandes zum Schutze des Landschaftsbildes am Zürichsee.* [?1948]. pp. 13. [G.]

[1556]. 09.7 (495 : 499). TSCHERMAK, L. Waldbauliches aus Griechenland. [**Notes on silviculture in Greece.**] *Cbl. ges. Forstw.* 70 (2), 1947 (203–18). 14 refs. [G.]

A descriptive account in general terms, with brief introductory sections on Greece's poverty in forests, her forest area and the proportional representation of the various tree species, followed by notes on the author's excursions in spring 1944 in various parts of Greece and in Crete, and some remarks on the future treatment of the forests. [Cf. *For. Abstr.* 7 (Nos. 51, 2159); 9 (Nos. 1372, 2192).]

[1557]. 09.7 (689) : 05.3. **Northern Rhodesia Forest Department: Annual Report for the year 1947.** *Rep. For. Dep. N. Rhod.* 1948. pp. 18.

On Jan. 1, 1947, the Forestry Branch of the Department of Agriculture became the Forest Department, and accordingly occasion is taken in the annual report to review forest conditions and the relationship of the department to the forest resources of the territory.

[1558]. 09.7 (717). MCLEOD, J. W. **The forests of Prince Edward Island.** *For. Chron.* 24 (3), 1948 (191–4).

[1559]. 09.7 (748) : 91.8. INESON, F. A., and FERREE, M. J. **The Anthracite Forest Region: a problem area.** *Misc. Publ. U.S. Dep. Agric.* No. 648, 1948. pp. 71. 10 refs.

Part I of the report describes the general economic situation in the Anthracite Forest Region and discusses the past use and misuse of the forests. Their potential contributions to employment and income are estimated, and a programme of action is suggested. Part II describes in detail the situation in the 3 principal sub-regions.

[1560]. 09.7 (77). DEMMON, E. L. **Forestry situation in the Lake States.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 13, 1948. pp. 6. 1 tbl.

[1561]. 09.7 (801 : 728) : 32 : 12.26–8 : 07. LAMB, F. B. **Status of forestry in tropical America.** *J. For.* 46 (10), 1948 (721–6).

A brief account of commercial exploitation, Mahogany logging operations, industrialization,

government forest regulations, and institutes for education and research in forestry, in Central and South America.

[1562]. 09.7 (803). **Latin - American forestry: travel notes of two officers of the Division of Forestry and Forest Products.** *Unasylva* 2 (1), 1948 (9–17).

Notes on forest resources and industries, government policy, legislation, education, forest services, etc.

[1563]. 09.7 (88). WOLOWITCH, D. Ressources forestières de la Guyane française. **[Forest resources of French Guiana.]** *Bois For. Trop.* 7 (3), 1948 (222–6). [F.]

[1564]. 09.7 (931). DAVIES, W. C. **Some salient features of the New Zealand flora.** *Bulletin of the Royal New Zealand Institute of Horticulture*, Nov., 1947. pp. 16 + 23 photos. 16 refs.

[1565]. 09.7 (932) : 31.0. GRAY, H. R. **A note on a visit to New Caledonia.** *Aust. For.* 12 (1), 1948 (29–37). 4 refs.

A brief sketch of the vegetation, forest exploitation, ownership, taxes etc. together with a list of the principal commercial timber species, their air-dry weight and possible uses.

[1566]. 09.7 (935). WALKER, F. S. **The forests of the British Solomon Islands Protectorate.** Crown Agents for the Colonies, 4 Millbank, London, S.W.1. 1948. pp. 186 + 21 maps.

This, the first report to be published on the forests of the whole territory, includes: (1) description of the country, forest types, and present conditions (55 pp.); (2) proposals for future forest policy (16 pp.); (3) index of vernacular names (11 pp.); (4) the method of survey (2 pp.); (5) description of a collection of 306 specimens, mostly from trees of over 6 ft. in girth (100 pp.); (6) an index of scientific names (2 pp.).

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.11. Air Temperature

[1567]. 11.1 : 42.2 : 43.02 : 11.16. BYRAM, G. M. **Terrestrial radiation and its importance in some forestry problems.** *J. For.* 46 (9), 1948 (653–8). 3 refs.

In order to study the phenomena of terrestrial radiation, the author constructed miniature radiators which function like natural frost pockets, though with exaggerated effects. He also took temperature measurements on the ground and in the air above two neighbouring slopes with south and north aspects respectively. The cooling of fuels on cloudless nights by terrestrial radiation is shown to be an important factor in conserving or, more often, increasing their moisture content. The occurrence and effects of terrestrial radiation during the day (normally masked by insolation) were also demonstrated and shown to be responsible for e.g. the persistence of frost on north slopes even at temperatures above freezing and the absence of forest fires on steep north slopes during the late autumn in regions where fires occur at this season.

The part played by terrestrial radiation in the formation and maintenance of frost pockets is also discussed and illustrated.

11.14. Precipitations. Evaporation. Humidity

[1568]. 11.14.4 : 11.22. SAUBERER, F. Über die Schneedeckenverhältnisse Niederösterreichs und das Mikroklima im Schnee. **[On the snow-cover conditions of Lower Austria and the internal microclimate of snow.]** *Cbl. ges. Forstw.* 70 (2), 1947 (138–57). 17 refs. [G.]

Reviews the subject with special reference to properties such as permeability of snow to gases, moisture in and beneath snow, temperature and heat conduction, radiation under snow cover, and to snow as a biological environment.

[1569]. 11.14.4 : 91.3 : 11.62 (494). BURGER, H. Einfluss des Waldes auf die Höhe der Schneedecke. **[Influence of the forest on snow depth.]** *Schweiz. Z. Forstw.* 99 (5), 1948 (226–31). [G.f.]

Shows in tables and graphs the snow depths measured every winter since 1915–16 in the

Sperbelgraben, on different aspects and under different kinds of forest cover, and the Rappengraben, on different aspects of open slopes. From these it is obvious that cover and aspect influence snow depth to a marked degree. But the measurements took no account of type and density of the snow, and the author emphasizes the great difficulty of giving numerical values to such data when studying the water regime of a catchment. Even if an adequate number of snow profiles could be taken, and the area of the different plant cover types and all the local and temporal differences in water equivalent of the snow determined, the result for a catchment with varied cover would still be no more than an informed estimate.

11.2. *Climate and Microclimate*

See also *For. Abstr.* 10 (Nos. 1568, 1648, 2328).

[1570]. 11.2 (714). VILLENEUVE, G. O. Aperçu climatique du Québec. [**A brief account of the climate of Quebec.**] *Bull. Bur. Mét. Québec* No. 10, 1948. pp. 25. 12 refs. [F.]

Cf. *For. Abstr.* 9 (Nos. 144, 726).

11.4. *Soil*

See also *For. Abstr.* 10 (Nos. 1648–9).

11.41. Soil Physics

See also *For. Abstr.* 10 (Nos. 1584, 2342–3).

[1571]. 11.41.3 : 22.83.2 : 11.47.2. MAŘAN, B. Vliv podrostů na vlhkost lesní půdy. [**Influence of understoreys on the moisture of forest soils.**] *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (55–77). Numerous refs. [Cz.e.russ.] [Ústav lesní biochemie a pedologie, Prague.]

Sets forth the results of studies in Bohemia and Moravia on the influence of Silver Fir and Norway Spruce under Scots Pine, Birch or Oak, and of Beech, Oak and/or Hornbeam under Pine/Larch or Oak, on soil moisture in soil types varying from brown earths to podzols. Includes accounts of (*a*) observations limited to a single occasion per site, and (*b*) periodical investigations, chiefly during the growing season. Only the results of (*b*) are noted here:—(1) In Scots Pine with an understorey of Norway Spruce, in a very moist region, the humus layers and A horizons were moister, especially in the summer, than under Scots Pine alone. The B horizons were drier in the stand having an understorey, and showed greater non-capillary porosity and less accumulation of sesquioxides. (2) In warm, dry localities the driest soil was that under pure, even-aged Norway Spruce polewood. The greatest differences in soil moisture occurred in the upper horizons and were gradually smoothed out with increasing depth. (3) Soils in stands with an understorey were more porous, the greatest differences in porosity occurring in the upper soil horizons. Lowest total porosity was shown by soil under even-aged Spruce polewoods, though in a few instances the upper horizons of such soils were more porous than those under Birch with no underwood. (4) Average soil moisture (average for all horizons and seasons) was generally greatest under light-demanding conifers or hardwoods with no understorey, though the differences from those with an understorey were small. (5) In winter and spring, stands with no understorey had the moister soils; in summer the moister soils were found under light-demanding conifers and hardwoods with either Spruce or hardwood understoreys—a fact of importance in warm dry regions. In dry autumn periods the differences were largely smoothed out, but there was a tendency for moister soils to occur in stands without underwood. (6) Underwood of deciduous species had more favourable chemical and physical effects, especially on soil moisture, than conifer underwood.

[1572]. 11.41.5–6 : 01.4 : 11.42 : 97.1 (675). D'HOORE, J., and FRIPIAT, J. **Structural variations of Yangambi (Belgian Congo) soils.** *Soil Sci.* 66 (2), 1948 (91–104). 9 refs.

It has been observed that plant rootlets exert a peptizing action on flocculated soil colloids. A method is described for determining the peptized and flocculated colloid content of soils without altering the natural properties of the colloids. The techniques were used to study the fallow problem at Yangambi (where the normal agricultural succession is: primeval forest; cultivated (food) crops; fallow, *Musanga smithii*; secondary forest) and some preliminary results are given. *From authors' summary.*

11.42. Soil Chemistry

See also *For. Abstr.* 10 (Nos. 1572, 1581, 1818).

[1573]. 11.42 (86) : 11.44 : 11.2 : 11.3. JENNY, H., BINGHAM, F., and PADILLA-SARAVIA, B. **Nitrogen and organic matter contents of equatorial soils of Colombia, South America.** *Soil Sci.* 66 (3), 1948 (173–86). 26 refs.

Analyses were made of soil samples collected from about 100 different localities in Colombia, and the climatic and topographical relationships studied. In a comparison of Colombian and North American soils, having equal annual temperatures and annual moisture values, it was found that the Colombian soils have much higher N and organic-matter contents than the North American. The weight of forest floor per unit area is low in the primeval forests of the humid hot zones. In the subtropical and temperate regions it is higher and corresponds to that of the central U.S.A. *From authors' summary.*

11.43. Biology of Soil, including Mycorrhiza

See also *For. Abstr.* 10 (Nos. 1593, 1691).

[1574]. 11.43 : 02.1. POCHON, J., and TCHAN, Y. T. Précis de microbiologie du sol—principes, techniques, place dans les cycles géobiologiques. **[Summary of soil microbiology—principles, techniques, place in geo-biological cycles.]** Masson et Cie, Paris. 1948. pp. 222 + 2 plates. 188 refs. [F.] (Monographies de l'Institut Pasteur.)

[1575]. 11.43.1. HARLEY, J. L. **Mycorrhiza and soil ecology.** *Repr.* from *Biol. Rev.* 23, 1948 (127–58). 132 refs.

In this article an attempt is made to approach the problems of ectotrophic mycorrhizas from a consideration of soil ecology. Part of the aim of the review is to present a sample of the knowledge concerning the association of roots and micro-organisms in such a way as to enable a clearer impression of the terms mycorrhiza and pseudomycorrhiza to be achieved. No attempt has been made to include the extensive material on endotrophic mycorrhizas. *From author's introduction.*

[1576]. 11.43.1 : 07.2 : 01.4 : 12.25 : 44.3. JACKSON, L. W. R. **Method for differential staining of mycorrhizal roots.** *Science* 105 (2724), 1947 (291–2). 7 refs. [George Foster Peabody School of Forestry, University of Georgia.] O.R.S.

Describes a differential staining technique, using picroaniline blue, for the investigation of mycorrhizal roots. Results obtained from this technique suggest that foliar decline diseases in Pine may be related to a reversal of symbiosis, which causes the mycorrhizal fungi to become parasitic on the short roots when soil conditions become unfavourable.

[1577]. 11.43.2. JAHN, E. Die Bodentiere des Waldes. **[The soil fauna of the forest.]** *Cbl. ges. Forstw.* 70 (1), 1947 (65–80). 38 refs. [G.]

A review of literature, with special reference to ecology and particularly to the relation between soil population levels and environment.

11.44. Litter. Surface Humus

See also *For. Abstr.* 10 (No. 1593).

[1578]. 11.44 : 11.43.1. KUŹNIAR, K. Badania nad rozkładem błonnika w glebach leśnych. **[A study of the break-down of cellulose in forest soils.]** *Rospr. Spraw. Inst. Bad. Leśn., Kraków* No. 50, 1948. pp. 41 + 3 photos, 1 dgm., 3 tbls. 34 refs. [Pol.e.]

A detailed account of an experiment on the rate at which cellulose is broken down by bacteria in various Pine soils, with a summary of the literature on this subject. The interest of the experiment for the silviculturist is seen by the author in its contribution to a better understanding of the role of cellulose in the formation of humus, which is generally said to consist chiefly of lignin. The experiment was carried out (1) by the Vinogradsky method, which consisted in placing pieces of filter paper, previously boiled in a 1% solution of NaOH and rinsed in distilled water to remove all traces of alkali, on silica-gel plates inoculated with the tested soils, (2) with pieces of linen, boiled in 2% NaOH and rinsed until no alkali remained, and placed on Petri dishes filled with soil, and (3) by burying pieces of linen, treated as above, in the forest soil itself at different depths. Comparing these methods the author notes that method (1) enables one to observe the bacteria actually attacking the cellulose and to identify them, but does not give sufficient

guarantee against infection by foreign bacteria; the process of inoculating the plates, moreover, is tedious. Method (2) is much simpler and quicker, there is less likelihood of infection, but identification of the bacteria is difficult. Method (3), in the author's opinion, is the most reliable method, though the longest, as it requires six months. Method (1) offers the possibility of establishing a correlation between the intensity of the process of the break-down of cellulose and changes in the colour of the latter; in the case of poorer soils the cellulose became only lightly tinted while in the case of better soils it turned black, brown or dark yellow. As a similar change of colour was observed under method (3), the author suggests that there may exist a relation between the colour of the soil and its microflora. Tests by the Vinogradsky method have also shown that an appreciable difference exists in the rate of break-down in soils of different quality; thus the rate, expressed in terms of % loss of initial weight, was found to be 46·2 ± 4·95% and 54·6 ± 3·07% in May and 34·6 ± 6·76% and 62·7 ± 3·12% in September for I and II quality soils respectively and 0% and 15·0 ± 3·5% in May and 5·4 ± 0·87% and 6·1 ± 0·77% in September for III and IV quality soils respectively. It has also been observed that on poorer soils the break-down was limited to the surface, whereas on better soils it occurred throughout the profile down to the water table. This led the author to conclude that the rate at which the cellulose is broken down by bacteria may serve as an indicator of the quality of a forest soil.

[1579]. 11.44 : 12.26–8 : 12.11.11. ANDERSSON, S. E., and ENANDER, J. Om produktionen av lövförna och dennas sammansättning i ett mellansvenskt aspbestånd. **[On the production of leaf litter and its composition in a central Swedish Aspen stand.]** *Svenska SkogsvFören. Tidskr.* 46 (4), 1948 (265–70). 5 refs. [Sw.g.]

Litter production for the period Sept. 29–Dec. 21, 1947, in a 40-year-old Aspen stand near Stockholm, was found to be 1,958 ± 174 kg. (air-dry: moisture content 7·82% of the air-dry weight) per ha. The litter contained, in % of its oven-dry weight: ash 9·53, Fe_2O_3 0·015, Al_2O_3 0·044, MnO 0·038, CaO 3·34, MgO 0·44, K_2O 0·98, Na_2O 0·012, CuO 0·0025, SiO_2 1·56, SO_3 0·25, Cl 0·16, B 0·0029, and N 0·58. Thus Aspen returns to the soil, per ha./year, 60·3 kg. CaO, 17·7 K_2O, 10·5 N and 2·3 P_2O_5. Results are tabulated and compared with those of other workers for Norway Spruce and Birch [see *For. Abstr.* 5 (161); 8 (No. 63); and *Svenska SkogsvFören. Tidskr.* 37, 1939 (339–47)].

11.47. Maintenance of Favourable Soil Conditions

See also *For. Abstr.* 10 (Nos. 1571, 1728–30, 1747, 1754, 1760, 1979, 2039, 2241).

[1580]. 11.47.2 : 32.29.2 : 21.3 : 12.11.11 : 31.3. MAŘAN, B. Význam klestu pro obohacení půdy živinami. **[The importance of brushwood for improving the nutrient status of the soil.]** *Lesn. Práce* 27 (4/5), 1948 (150–62). 23 refs. [Cz.russ.] [Stát. výzkumné ústavy lesnické, Praha.]

Discusses the ash constituents, and their distribution in branch and stem wood, of various species (especially Sycamore Maple, Hornbeam, Aspen, Birch, Norway Spruce and Austrian Pine) growing on calcareous soils (rendzinas) of high nutrient status near Karlstein. Emphasis is laid on the importance in such studies of distinguishing between wood analysed with and without bark. [In the following, "branchwood" is to be taken as including and "stemwood" as excluding bark unless expressly specified.]

On these rendzinas the mineral nutrient content of wood, bark and foliage was higher than on "noncarbonate" soils. Ash, Aspen, Lime, Sycamore Maple and Hornbeam are regarded as among the best soil improvers; Birch comes low in the scale, and conifers lowest.

The ash content of branchwood (branches and twigs) exceeded that of stemwood, averaging for all species about 4 times that of stemwood without or 3 times that of stemwood with bark. The thinner the branch, the higher was its ash content. Of the various constituents, the bases showed the greatest differences, the base content of branchwood averaging respectively 5 and 3 times that of stemwood and stemwood plus bark. Branchwood concontained about 7 times as much CaO as stemwood (about 3½ times as much as stemwood plus bark, owing to the very high CaO content of stem bark), and about 4 times as much K_2O.

Differences between wood with and without bark were less marked in the case of MgO, K_2O and Na_2O. The SiO_2 and P_2O_5 contents of branchwood were only 2–2½ times those of stemwood, little difference existing between wood and wood plus bark. Branchwood of the deciduous species had a much more favourable base/acid ratio and contained more P_2O_5 and less SiO_2 than that of the conifers.

The results, which are tabulated in some detail, are used as evidence of the importance of leaving brushwood in the forest to maintain favourable soil conditions.

[1581]. 11.47.21 : 11.42 (675) : 33.38. KUCZAROW, W. Remarques sur le charbon de bois dans les sols du Congo. **[Charcoal in Congo soils.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (663–9). 5 refs. [F.]

An attempt was made at Yangambi to estimate the amount of charcoal resulting from burning (*a*) tropical forest, (*b*) savanna, in the Belgian Congo. By a combination of experiment and theoretical calculation, it is estimated that burning the total mass of vegetation of primary forest of the Congo basin would produce 15–20 metric tons of charcoal and 2·3–3·5 metric tons of ash per ha. on the borders of the forest, and about 10–15 tons of charcoal in the interior. It is pointed out that 10 metric tons/ha. amounts to a uniform layer of 3 mm. Similar estimates for savanna with grass about 2 m. high, are 1,560 kg. of charcoal and 490 kg. of ash per ha.

Experiments were made on the adsorptive effect of charcoal on litter extract. The data refer to the degree of adsorption after 12 hours' contact, but in fact the process is very rapid. A simple, rapid percolation of 150 ml. of litter extract (containing 0·22 mg. of organic C and 0·077 mg. of N per ml.) through 50 g. of fine charcoal, deprived the liquid of 16% of its C and 61% of its N, which gives some idea of the importance of adsorption during the first rains after burning. Grass charcoal has a higher ash content and less adsorptive capacity than wood charcoal. Wood charcoal appears to fix the adsorbed products very strongly, and several energetic leachings succeeded in freeing only a very small proportion of them.

Analysis of the litter extract before and after adsorption, showed that contact with the charcoal produced selective variations in the composition of organic soil solutions, which showed themselves in changes in the C/N ratio. Modification of pH also takes place; the pH of the solution after adsorption is higher by about one unit than that of the original solution. It is concluded that charcoal in the soils of central Africa may play an important and hitherto unsuspected role, particularly in savanna soils where it accumulates progressively.

11.49. Soil Types

See also *For. Abstr.* 10 (No. 2341).

[1582]. 11.49 (431–5). GANSSEN, R. Versuch einer Gliederung deutscher Waldböden. **[A tentative classification of German forest soils.]** *Mitt. Reichsinst. Forst- u. Holzw.* No. 3, 1948. pp. 9. 14 refs. [G.g.e.f. span.]

Notes on the types distinguished, with a tabular conspectus giving very brief indications of their occurrence, degree of development, associated forest types and other vegetation.

[1583]. 11.49 (45) : 11.45.2 : 12.19.2 : 12.25 : 12.26–8. ALINARI, E. Contributo alla conoscenza degli effetti della vegetazione sul terreno forestale nei nostri climi. **[The effects of vegetation on forest soil in our climate.]** *Ital. for. mont.* 3 (4), 1948 (212–24). [It.it.]

In order to elucidate the influence of vegetation on the formation of forest soils under Italian climatic conditions, the author analysed and compared samples of soil from a Beech wood and a Fir wood in neighbouring forests in Vallombrosa. The results of the analysis are detailed, and it is concluded that, contrary to the usual findings in northern forests as recorded in the literature, no distinct differentiation exists between the two soils, dependent upon the species growing on them. The investigation also revealed the extreme poverty of both soils in available Ca and suggested that Ca may in fact be the limiting factor in the development of vegetation in this area. It is proposed to carry out similar investigations in other forest soils, e.g. in the Apennines and the Alps.

[1584]. 11.49.6 : 12.26–8 : 11.41.7 : 56 : 64. **[Laterization of soil in Teak plantations.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (92–100).

It had previously been discovered [cf. *For. Abstr.* 9 (No. 77)] that the chemical composition, topographical features and mechanical

composition of the soil appear to influence the growth of Teak. The tentative conclusion then reached was that the dominating factors are the molecular ratio of SiO_2 to sesquioxides; north aspect, available water and good drainage; and the dispersion factor (amount of clay before dispersion/total amount of clay × 100) With a view to confirming this, soils from different localities were analysed mechanically, and the results are presented in a series of tables. The data indicate that:—(1) There is, in most cases, a tendency for mean weighted size of particles (i.e. sum of mean diameters × percentage for all fractions/100) to increase as the quality of Teak falls. (2) Where the dispersion coefficient is low, so is the quality of Teak. On the basis of these investigations, an attempt was made at forecasting the quality of Teak to be expected after clear felling a natural forest and planting; considerable agreement was found between the results of the forecast and measurements of 3-year-old Teak.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 10 (Nos. 1569, 1801, 1804–5, 1809, 1811, 1818, 1826, 1830).

[1585]. 11.6 (803). Vogt, W. **Latin-American Timber, Ltd.** *Unasylva* 2 (1), 1948 (19–26).

Points out the problems of soil erosion and water supply in South America and the need for caution in exploiting the forest resources of the region.

[1586]. 11.62. Horton, R. E. **Infiltration and run-off during the snow-melting season, with forest-cover.** *Trans. Amer. geophys. Union* 2 (1), 1945 (59–68). 7 refs. L.S.

This paper presents a new method of analysis of rainfall and run-off data which permits surface run-off and groundwater flow to be segregated and infiltration capacity determined during stream-rises. The method is equally applicable to areas with and without snow cover. The determination of infiltration capacity during the snow-melting periods is, however, the most difficult problem and the method is here applied to this case, using data for areas in the Allegheny Experimental Forest, with varying degrees of forest-cover density. For these areas the rate of snow-melting per degree-day of temperature excess above 32° decreased as the cover density increased.

During snow-melt, infiltration took place at rates governed by the rate of supply of rain and melt-water, averaging for the entire snow-melting period one-third to one-quarter of the infiltration capacity of the soil. The infiltration capacity under snow cover with unfrozen soil was found to be about 0·05 in. per hour or 1·20 in. per day. There was no significant difference between infiltration capacity of those areas with different forest-cover densities. Since the infiltration capacity of these areas greatly exceeded the average rate of supply of melt-water during the melting period, and the rate of supply of melt-water decreased as the forest cover density increased, it appears that, under the conditions of the experiments, increased forest cover may operate to materially reduce run-off intensity during the snow-melting period. The opposite effect can, however, be brought about by the occurrence of a rain on ripe snow in the forest at a time when the snow cover would have disappeared from an open area. On the other hand, snow cover in forest may absorb a rain which would produce heavy run-off from decreased snow cover or bare ground in the open, especially if the soil surface in the open has frozen after the snow disappeared. *Author's summary.*

[1587]. 11.62 : 01.7. Wilm, H. G. **How long should experimental watersheds be calibrated?** *Res. Notes Rocky Mt. For. Range Exp. Sta.* No. 2, 1948. pp. 5.

A procedure is worked out by which the necessary minimum length of the calibration period and of the total duration of a catchment experiment may be estimated by logical and statistical methods. In principle the method is analogous to the familiar formula for estimating 'K'. The use of the method is illustrated by means of data obtained in a catchment study at the Fraser Experimental Forest, for which a number of years' records of water yield are available.

[1588]. 11.62 (794) : 43.11 : 91.3 : 07.2 : 01.4. Rowe, P. B. **Influence of woodland chaparral on water and soil in Central California.** California Department of Natural Resources, Division of Forestry. [1948]. pp. 70. 43 refs.

Presents the results of the first 9 years of an experiment started in 1929 at North Fork,

California, to study the influence of woodland-chaparral vegetation of the Sierra Nevada foothills on surface run-off, erosion, and water yield. Measurements were made on 3 sets of plots, (1) burned annually, (2) burned twice (1930 and 1936) in the 9 years, and (3) left undisturbed. During the 9 years of study, surface run-off from (1) averaged 14%, from (2) 2% and from (3) 0·1% of precipitation. Average annual erosion rate in lb./acre was 25,000 for (1), 1,000 for (2) and 1·5 for (3). A large part of the surface run-off and erosion from (2) occurred during the 2 years immediately after burning. Infiltration capacity of the soil on (1) was reduced by more than 95% during the first 3 or 4 years of burning; thereafter more than 75% of the rainfall produced run-off from these plots. On (2), the average infiltration capacity was reduced about 80% by the first burning; as the vegetation regrew between burnings, infiltration capacity gradually increased, but the second burning resulted in a 90% reduction on the initial infiltration capacity. On (3) the average infiltration capacity of the soil was in excess of the highest rainfall rates experienced during the period.

Over a period of 4 years, vegetation on (3) used about 2 in. more water per year than that on (1) but this was offset by greatly increased flash flows of silt-laden water from (1).

The bulletin also discusses supplemental studies on the effects of erosion pavement, snow cover, burrowing of small animals and fluctuations in soil moisture, as well as methods and instruments used in the work.

[1589]. 11.62 (421–9) : 91.4 : 94.12 : 96 : 97.1. **Gathering grounds: Public access to gathering grounds: Afforestation and agriculture on gathering grounds. Report of the Gathering Grounds Sub-Committee of the Central Advisory Water Committee.** H.M. Stationery Office, London. 1948. pp. 34. Price 9*d*.

Evidence was taken from 37 water undertakings and 14 other interested bodies. A summary is given in tabulated form of evidence from water undertakers having large impounding reservoirs. The following recommendations are made:—(1) Arrangements should be made to dispose of the sewage from human habitations, whether permanent or temporary, in a manner which will entirely preclude the possibility of its getting into the reservoir. (2) Farmyard manure should be prevented from draining directly into feeder streams or reaching the reservoir. (3) The public should be generally excluded from the banks of reservoirs and no bathing should be allowed. Fishing and boating may in some cases be allowed at the undertaker's discretion, but only under rigorous control. Restrictions applicable to reservoirs will in some circumstances apply equally to feeder streams. (4) Subject to the above safeguards, the land should be put to the utmost agricultural use. The sub-committee were satisfied that many gathering grounds could be put to greater agricultural production than at present. (5) Land unfit for agricultural use, should if possible be afforested, but with due regard to amenity and the requirements of adjacent agriculture. (6) Subject to the foregoing recommendations, there is no reason to exclude the public from gathering grounds as such.

[1590]. 11.62.11 (792) : 11.62.31. CRADDOCK, G. W. **Watershed management and sediment control.** [? Intermountain For. Range Exp. Sta.] [?1948]. pp. 10.

General principles, with a brief reference to successful treatment of badly eroding catchments by exclusion of grazing and fire, construction of contour trenches, and artificial resowing [? with grasses].

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

[1591]. 12.1 : 01.2 : 02.4. STEINMETZ, E. F. **Vocabularium botanicum.** E. F. Steinmetz, Keizersgracht 714, Amsterdam. [1947]. pp. 362. [Du.G.E.F.]

Botanical terms are given in one of two columns according as they are of Latin or Greek derivation, followed by Dutch, German, English and French meanings in separate columns.

12.11. Physiology. Reproduction. Growth

See also *For. Abstr.* 10 (Nos. 2223, 2274).

[1592]. 12.11 : 07.2 (73) : 12.14 : 44.3 : 45.3. CROCKER, W. **Growth of plants: twenty years' research at Boyce Thompson Institute.** Reinhold Publishing Corporation,

330 West 42nd St., New York, 18. 1948. pp. 459. 731 refs. Price 60*s*.

A critical summary of the researches carried on at the Boyce Thompson Institute. Each chapter has a summary and list of references. The following chapters are included:—life span of seeds; dormancy in seeds; physiological effects of ethylene and other unsaturated carbon-containing gases; effect of certain lethal gases upon plants and animals; plant hormones; dormancy in buds; plant cell membranes; plants grown under controlled environmental conditions; research on insecticides; fungicidal investigations.

[1593]. 12.11 : 11.44 : 11.43 : 21.3 : 21.8. Neilson-Jones, W. **The growing plant.** Faber and Faber Ltd., 24 Russell Square, London. 1948. 206 + 16 photos. 26 refs. Price 16*s*.

A collection of papers on a number of aspects of plant life which, in the author's experience, provoke general interest but are usually treated only in advanced texts that may not be easily accessible to the elementary student or lay reader.

12.11.1. *Metabolism. Plant Constituents. Translocation. Sap Flow. Transpiration. Growth Substances*

See also *For. Abstr.* 10 (Nos. 1579–80, 1728, 1893–4, 2156, 2160, 2163, 2171–5, 2179–80).

[1594]. 12.11.1 : 12.25 : 12.14.3. Slankis, V. Verschiedene Zuckerarten als Kohlenhydratquelle für isolierte Wurzeln von *Pinus sylvestris*. **[Various sugars as carbohydrate source for isolated roots of *Pinus sylvestris*.]** *Physiol. Plant., Copenhagen* 1 (3), 1948 (278–89). 16 refs. [G.g.]

Xylose, arabinose, mannose, galactose and mannitol were found to be unsuitable as carbohydrate sources for the growth of isolated roots of *Pinus sylvestris*, which grew well with glucose and fructose, but best with sucrose. Optimum concentrations of glucose and sucrose were 4% and 7% respectively. *From author's summary.*

[1595]. 12.11.11 : 12.25 : 34.26. Sörensen, N. A., and Bruun, T. **The occurrence of a [new] diterpene-camphor [cryptopinone] in Scots Fir (*Pinus silvestris* L.).** *Acta chemica scandinavica* 1 (1), 1947 (112–3). 6 refs. O.R.S.

[1596]. 12.11.11 : 12.26–8. Deulofeu, V., Labriola, R., and Berinzaghi, B. **Structure of α-fagarine [, an alkaloid isolated from *Fagara coco*].** *Nature, Lond.* 162 (4122), 1948 (694).

[1597]. 12.11.11 : 12.26–8 : 34.25. Hills, K. L., and Rodwell, C. **The distribution and nature of the alkaloids in developing seedlings of *Duboisia myoporoides* and *Duboisia leichhardtii*.** *J. Coun. sci. industr. Res. Aust.* 19 (3), 1946 (295–302). 3 refs. P.R.

Examination of developing seedlings of *D. myoporoides* and *D. leichhardtii* has shown that appreciable quantities of hyoscine are evenly distributed in the principal parts of the plant at an early stage, but that hyoscyamine does not appear until later. Nine-months-old trees of both species contained maximum amounts of the 2 alkaloids, approximately in the proportions expected in mature trees of the several types examined. *Authors' summary.*

[1598]. 12.11.12. Beilmann, A. P. **The rise and fall of sap.** *Trees, Cleveland (Ohio)* 8 (6), 1948 (6–7, 20). 4 refs.

The author briefly reviews theories of sap movement, and concludes that Dixon's cohesive tension theory is the only satisfactory explanation for the movement of sap through a tall trunk. The work of Lund and Rosene, indicating that electric fields govern the distribution of hormones, is a satisfactory explanation of bud opening in spring. Osmosis, long thought of as a conducting mechanism, may be restricted largely to the medullary rays and the adjacent tracheids. *From author's summary.*

[1599]. 12.11.14 : 12.26–8 : 42. Danilov, M. D. O zimney transpiratsii odnoletnikh pobegov raznovozrastnŷkh derev'ev barkhata amurskogo. **[On the winter transpiration of one-year-old shoots of variously aged trees of *Phellodendron amurense*.]** *Priroda, Moskva* 37 (5), 1948 (44–5). 10 refs. [Russ.] A.C.P.

Observations have shown that both winter transpiration and morphological features of leading shoots of *Phellodendron amurense* change considerably with the age of the trees. Transpiration from leaders of 3-year-old plants

in November and January was considerably greater than from those of older trees; a similar but much less marked difference still existed in April. Leaders of 6-year-old *P. amurense* transpired at the same rate as the leaders of older trees; presumably, therefore, the morphological and physiological characters determining their winter transpiration are formed by 6 years of age. The facts observed help to explain the greater winter mortality of shoots of young trees of *P. amurense* in comparison with those of older trees.

[1600]. 12.11.14 : 12.29 : 07.7. RINGOET, A. Sur la transpiration d'une plantation d'*Elaeis guineensis*. **[The transpiration of a plantation of *Elaeis guineensis*.]** *C. R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (212–23 + 7 gphs). [F.]

[1601]. 12.11.15 : 12.11.2 : 23.26.3 : 23.23.15. SEWANDONO, R. Groeistoffen. **[Growth substances.]** *Tectona* 38 (1), 1948 (13–31). 21 refs. [Du.e.]

A review, chiefly of the uses of synthetic growth substances and particularly of their use in propagation by cuttings. [Cf. *For. Abstr.* 10 (Nos. 1609–11, 1851).]

[1602]. 12.11.15 : 12.26–8. GRAY, R., and BONNER, J. **Structure determination and synthesis of a plant growth inhibitor, 3-acetyl-6-methoxybenzaldehyde, found in the leaves of *Encelia farinosa*.** *J. Amer. chem. Soc.* 70 (3), 1948 (1249–53). 15 refs. O.R.S.

It is suggested that the presence of the growth inhibitor described may be responsible for the fact that only a few individuals of desert annuals are found growing in close association with the shrub *Encelia farinosa* in the desert.

12.11.2. *Reproduction. Propagation. Growth. Development*

See also *For. Abstr.* 10 (Nos. 1601, 1725, 1749, 1796–7, 1850–2).

[1603]. 12.11.2 : 23.26. SHEAT, W. G. **Propagation of trees, shrubs, and conifers.** Macmillan & Co. Ltd., London. 1948. pp. xii + 479. Price 25*s*.

A general account of methods of propagation (sowing, division, layering, cuttings, grafting, budding), followed by detailed instructions for propagating more than 1,000 species and varieties of trees and shrubs.

[1604]. 12.11.21. HUANG, T. C. **Chemical stimulation in pollen germination and pollen tube growth.** *Bot. Bull. Acad. sinica* 2 (4), 1948 (282–90). 32 refs.

Studies of pollen germination and pollen-tube growth in *Prunus armeniaca*, *P. persica* and *Pinus massoniana* were made in order to find the effect of the addition to the culture medium of micro-elements, vitamins, fatty acids, hydroxy acids, dibasic organic acids, amino acids, auxins, indole derivatives, purines and colchicine. Micro-elements (with the exception of $CuSO_4$), vitamins, tartaric, glycollic, malic, citric, fumaric, succinic, aspartic, and glutamic acids were favourable to pollen germination and pollen-tube growth. Many acids, colchicine and guanine were neither markedly harmful nor beneficial, but in low concentrations they may cause some stimulation, since pollen germination is generally accelerated in an acid medium. Colchicine in higher concentrations had an inhibiting effect, especially with Pine.

[1605]. 12.11.21 : 12.26–8 : 12.11.3. PYATNITSKI, S. S. O khranenii pŷltsŷ dubov. **[The storage of Oak pollen.]** 12 (3), 1947 (32–5). 8 refs. [Russ.] *Dokl. vsesoyuz. Akad. sel'sko-kh. Nauk Lenina.* [Ukrainski Nauchno - Issledovatel'ski Institut Agrolesomelioratsii i Lesnogo Khozyaystva.] A.C.P.

Reports briefly, with tables, the results of germination and storage experiments with Oak pollen, which showed that:—(1) Pollen of Oaks of the sections Cerris (*Q. suber*, *Q. acutissima*), Mesobalanus (*Q. macranthera*) and Lepidobalanus (*Q. robur*, *Q. macrocarpa*, *Q. alba* and *Q. montana*) germinated best in 0·4–0·6 *N* solutions of sucrose, whereas for pollen of *Q. borealis* var. *maxima* (section Erythrobalanops) the optimum concentration was 1·0 *N*. (2) The best conditions for storing pollen of *Q. robur* were a temperature of 0° C. and keeping in a desiccator over 35% H_2SO_4, i.e. at a relative humidity of about 60%. Under these conditions pollen was still about 40% viable after 66 days.

[1606]. 12.11.21 : 12.26–8 : 12.11.3. **[Storage of Eucalypt pollen.]** *Rep. For. Timb. Bur. Aust. 1946*, [1948?] (13).

Methods of collecting, storing, and testing the viability of Eucalypt pollen were developed

and methods of bulk emasculation and hybridization investigated. It was found that pollen of *E. viminalis* stored under controlled conditions of temperature and humidity retained some germinative power for 11 months after collection. If, as it appears, Eucalypt pollen can be stored for a considerable period, hybridization of species flowering at different times is practicable.

[1607]. 12.11.22 : 12.25 : 23.24.1. **[Vegetative propagation of *Pinus radiata.*]** *Rep. For. Timb. Bur. Aust. 1946*, [?1948] (12).

Experiments were continued with the object of developing the best possible technique for the vegetative propagation of *Pinus radiata.* Following up an indication obtained from a 1945 experiment [cf. *For. Abstr.* 9 (No. 103)], work was concentrated on experiments in the use of galvanized-iron planting tubes. It was found not only that the use of tubes resulted in a high establishment %, but also that the root systems of tubed cuttings were definitely superior to those of cuttings raised in nursery beds.

[1608]. 12.11.22 : 12.26–8. **[Vegetative propagation of Eucalypts.]** *Rep. For. Timb. Bur. Aust. 1946*, [?1948] (12).

The following species were raised successfully from cuttings:—*Eucalyptus blakelyi, E. bicostata, E. globulus, E. maculosa, E. grandis, E. bosistoana, E. racemosa.* The basic conditions necessary for success in raising Eucalypts from cuttings were found to be (1) the use of juvenile foliage, (2) partial shade and (3) the setting of the cuttings in autumn or winter. Heating of the soil seems beneficial.

[1609]. 12.11.22 : 12.26–8 : 12.11.15. LARSEN, C. M. **Experiments with softwood cuttings of Henry's Poplar.** *Aarsskr. Vet.-Landbohøjsk.* 1948 (42–63). 20 refs. [E.e.] [Arboretet, Hørsholm.]

(1) The rooting responses of softwood cuttings of *Populus vernirubens* [see *For. Abstr.* 9 (No. 1453)], after treatment with solutions of indole-butyric acid, naphthalene-acetic acid or 3-indole-acetic acid, were positive and normal. Marked toxic effects were observed when these substances were used at concentrations above those giving optimum rooting, viz. (in p.p.m.) 6·25 for indole-butyric, 16·67 for naphthalene-acetic and 200 for 3-indole-acetic acid. Some evidence of toxicity could also be observed at slightly lower concentrations.

(2) Rooting medium was important, peat moss or a peat-moss/sand mixture giving much poorer results than pure sand or gravel: pH was of minor significance under the conditions of the trials and did not affect results within the range 4·8–7·0 though some reduction of rooting occurred at pH 8·1.

(3) As previously reported, cuttings from the middle of shoots give the best rooting, and of 'middle' cuttings graded into degrees of angularity of cross-section, the most angular produced the greatest average number of roots per cutting.

[1610]. 12.11.22 : 12.26–8 : 12.11.15 : 12.11.23. LOO, T. L., and TANG, Y. W. **The effect of indole-3-acetic acid on root formation and bud development.** *Bot. Bull. Acad. sinica* 2 (4), 1948 (231–5). 22 refs.

Stem cuttings of Willow (*Salix* sp.) were treated with indole-3-acetic acid in lanolin (1% concentration) and the effects on rooting and budding observed. Root production was promoted by the treatment. Bud formation on leafless cuttings was inhibited, but the development of pre-existing buds was not affected. These results are discussed.

[1611]. 12.11.22 : 12.11.15 : 41 : 44.1. PRIDHAM, A. M. S. **The effect of 2,4-D on root induction.** *Proceedings of the American Society for Horticultural Science* 49, 1947 (359–62). 1 ref. E.M.B.

Over the concentration range of 2·5 to 750 p.p.m. 2,4-D shows approximately the same ability for root induction as does indole-butyric acid. The amount and character of roots produced follow the pattern of indole-butyric acid. High concentrations that are not lethal change the rooting habit; numerous stiff short roots, spread along and around the stem, instead of a few long roots arising from the end of the cutting. *From author's summary.*

[1612]. 12.11.22 : 12.26–8. OLIVEIRA, A. B. D'. Breve nota sobre alguns casos de enxertia do castanheiro sobre *Quercus.* **[Short note on some examples of Chestnut grafts on *Quercus.*]** *Bol. Junta nac. Cortiça, Lisboa* 8 (91), 1946 (294–5). [Port.]

In attempts to produce an ink-disease-resistant Chestnut, experiments were made in grafting Chestnut [*Castanea sativa*] on stocks

of various species, including *Quercus toza*, *Q. robur*, *Q. humilis* and *Q. suber*. A high number of successful grafts were made with *Q. robur* and *Q. suber*. It is not proved that the resulting strain is resistant to ink disease, but the author considers that the experiments are worth continuing in the hope of producing a Chestnut tolerant of calcareous soils.

[1613]. 12.11.23 : 12.11.22 : 12.14. PASSECKER, F. Entwicklungsphasen und vegetative Vermehrung holziger Gewächse. [**Developmental phases and vegetative propagation of woody plants.**] *Cbl. ges. Forstw.* 70 (3/4), 1947 (270–92). 19 refs. [G.g.]

Reviews, mainly on the basis of literature on fruit trees, the morphological differences that exist between juvenile and adult forms; the succession of phases in the life of the individual; temporary and permanent retention of phase characteristics in vegetatively propagated material; the zonation of phases represented by an adult tree (with juvenile portions at the base and successively more adult phases towards the apices of the shoots); preservation of the juvenile phases in mound-layering; loss of juvenile phases in long-continued grafting; influence of phase on rooting capacity of cuttings and success of grafts, the ageing of vegetatively propagated trees and suggested countermeasures (propagation from material of as young a phase as possible, e.g. from basal portions of the plant; maintenance of the future of a reserve of the 'young' phase of superior strains by means of root-suckers, layering, etc.); and the ecological significance of the phases, with a suggestion that the juvenile forms may be hereditarily fixed adaptations to a moist, shady habitat which is outgrown as the tree ages.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance. Cytology*

See also *For. Abstr.* 10 (Nos. 1604–6, 1623, 1707, 1710–1, 1719, 1726).

[1614]. 12.11.3 (485). LINDQUIST, B. **Genetics in Swedish forestry practice.** Svenska Skogsvårdsföreningens Förlag, Stockholm, and Chronica Botanica Co., Waltham, Mass., U.S.A. 1948. pp. 173. 63 refs. Price Kr. 9 (15*s.*) A translation into English of the author's *Den skogliga rasforskningen och praktiken* (Stockholm, 1946). [See *For. Abstr.* 8 (pp. 467–71).]

[1615]. 12.11.3 (73). GRAVES, A. H. **Forest-tree breeding [a summary of methods and work done in the U.S.A.].** *Econ. Bot.* 2 (3), 1948 (284–305).

[1616]. 12.11.3 (794) : 12.25. MOULDS, F. R. **The practical value of forest genetics.** *Aust. For.* 12 (1), 1948 (8–12). 4 refs.

Mainly an account of a visit to the Institute of Forest Genetics at Placerville, Calif., and methods employed there, especially artificial pollination and grafting.

[1617]. 12.11.3 : 12.25 (437). SVOBODA, P. Hrotovický modřín. [**The Larch of Hrotovice.**] *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (96–110). 20 refs. [Cz.e.russ.] [Ústav dendrologie a geobotaniky, Prague.]

Concludes from the evidence of old accounts and working plans that the high-quality Larch of S.W. Moravia, and especially of the Hrotovice district, is not an indigenous race but was introduced between 1810 and 1817, chiefly from Silesia. Some Alpine Larch was also introduced but is readily distinguishable by external features—a point of importance in selecting stands for seed collection. The Silesian race thrives on sites originally occupied by Oak/Hornbeam forest. The archives examined also bore witness to the extensive planting of Scots Pine and Norway Spruce in this region, outside their natural range.

[1618]. 12.11.3 : 12.25. SAARNIJOKI, S. *Larix decidua* × *sibirica*, ein neuer Lärchenbastard. [***Larix decidua* × *sibirica*, a new Larch hybrid.**] *Commun. Inst. for. Fenn.* 31 (1), 1942 (1–30). 37 refs. [G.fi.]

Describes and illustrates presumed F_1 hybrids found among natural seedlings in the Kitee Larch forest, N. Karelia, where both European and Siberian Larch plantations were made in the 1840's, and tabulates data on needle, cone and seed characters to demonstrate the intermediate position of the hybrids. Certain trees suspected of being F_2 hybrids were also discovered. In view of the inadequacy of the material, differences in age and site, and the fact that the Finnish Forest Research Institute is making controlled crossings of *L. decidua*

and *L. sibirica*, no study was made of comparative growth rates, but a few increment borings suggest that the presumed hybrid is not inferior to its parents in this respect.

[1619]. 12.11.3 : 12.25 (485). BUNDY, O. Avkommekontroll på olika talltyper i Södermanland. **[A progeny check on different types of Scots Pine in Södermanland.]** *Svenska SkogsvFören. Tidskr.* 46 (3), 1948 (224–6). [Sw.]

Tabulates and briefly discusses height measurements of plants put out at 2 years of age in 1937 in an apparently uniform sandy field, and derived from: (1) ordinary commercial seed; (2) trees 2–4 m. tall, on a peat bog at Östra Vingåker; (3) two 165-year-old trees, 31·5 m. tall, 40 and 52 cm.d.b.h., in a nature reserve at Julita; (4) four trees which had reacted vigorously to drainage, on a peat bog at Julita.

Heights of the progeny ranged in autumn 1947 from 1·1 to 5·1 m., dispersion being greatest for those of origin (1). Progeny of (3) were not above average in growth. The most vigorous height growth was shown by trees of group (4), but in all progenies some few vigorously growing trees occurred. The average heights of the various progenies in spring 1947 were: (1) 3·1, (2) 3·28, (3) 3·3 and (4) 3·59 m.

[1620]. 12.11.3 : 12.25 : 42.21 (776) : 21.0. RUDOLF, P. O. **Winter damage to Scotch Pine in Northern Minnesota.** *Tech. Notes Lake St. For. Exp. Sta.* No. 305, 1948. p. 1.

Observations in the Chippewa National Forest during the winter of 1947–48 showed that injury to foliage of *Pinus sylvestris* varied greatly according to seed origin. Trees grown from seed native to localities in the same climatic zone as the Chippewa National forest were largely uninjured, but those grown from seed originating in milder climates had a large part of their needles killed. [Cf. *For. Abstr.* 10 (No. 2214).]

[1621]. 12.11.3 : 12.26–8 (73). STEBBINS, G. L. JR., MATZKE, E. B., and EPLING, C. **Hybridization in a population of *Quercus marilandica* and *Quercus ilicifolia*.** *Evolution* 1 (1/2), 1947 (79–88). 13 refs. LEEDS U.

A study was made of population samples from *Quercus marilandica* and *Q. ilicifolia* growing together at Lakehurst, N.J., and from *Q. marilandica* growing in a mixed deciduous forest along with other *Quercus spp.* at Cliffwood, N.J. The samples were compared with herbarium sheets of these two collected outside the region of their overlap. Hybrid indices were computed. The Cliffwood material had the same general range of scores as the standard of *Q. marilandica*. In the Lakehurst population about 37% of the individuals collected were *Q. marilandica*, about 28% were *Q. ilicifolia*, and the remainder showed varying degrees of intermediacy, the gene flow being predominantly from *Q. ilicifolia* into *Q. marilandica*. *From authors' summary.*

[1622]. 12.11.3 : 12.26–8. SMITH-WHITE, S. **Cytological studies of the Myrtaceae. II. Chromosome numbers in the Leptospermoideae and Myrtoideae.** *Proc. Linn. Soc. N.S.W.* 73 (1/2), 1948 (16–36 + 2 photos, 91 dgms.). D.S.I.R.

Chromosome numbers are reported and discussed for 13 genera and 63 species representative of all taxonomic subdivisions of the Leptospermoideae and Myrtoideae, 55 species being reported on for the first time. The great majority of these are normal diploids, with a haploid chromosome set of 11. *From author's summary.*

12.12. Teratology. Pathology

[1623]. 12.12 : 12.25 : 12.11.3. JOHNSON, A. G. **Albinism in the Austrian Pine.** *J. Hered.* 39 (1), 1948 (9–10). O.R.S.

Two cases of albinism in seedlings of *Pinus nigra* var. *austriaca* are described and discussed. In one case seed was collected from an isolated, self-pollinated individual, and in the second case from an individual growing in a group where some cross-pollination is likely to have occurred.

12.14. Organography. Morphology. Anatomy. Histology

See also *For. Abstr.* 10 (Nos. 1613, 1672, 1686).

[1624]. 12.14.4. SMITH, R. B. **The rôle of mechanics in the evolution of the herbaceous plant stem.** *Abstr.* of thesis, in *J. For.* 46 (9), 1948 (658).

[1625]. 12.14.5 : 21.11 : 1225 : 12.26–8. MARCET, E. Licht- und Schattenblätter.

[Sun and shade leaves.] *Schweiz. Z. Forstw.* 99 (5), 1948 (278–80. + 2 plates). [G.]

Presents photographs of the leaves and microphotographs of sections for sun and shade leaves of Beech, Oak, Scots Pine and Yew, together with a brief commentary on their features.

[1626]. 12.14.5 : 12.26–8 : 21.2. MILLER, R. C. **A comparison of leaves of *Quercus coccinea* Muench. and *Betula lenta* L. from heath bald and mesophytic ravine habitats.** *Proc. Iowa Acad. Sci. 1946* 53, 1947 (171–4). A.P.B.

An account of a morphological investigation and comparison of the leaves of *Quercus coccinea* and *Betula lenta* as an indication of their adaptability to different environments. *Q. coccinea* is better adapted in general to xerophytic conditions and appears to accommodate itself to them by a large increase in the amount of cuticle on the upper and lower leaf surfaces, by an increase in the thickness of the upper epidermis, by the addition of a layer of hypodermis and by an extra layer of palisade tissue.

[1627]. 12.14.7 : 12.25 : 12.13. WILDE, M. H., and EAMES, A. J. **The ovule and 'seed' of *Araucaria bidwilli* with discussion of the taxonomy of the genus. I. Morphology.** *Ann. Bot.* 12 (47), 1948 (311–26 + plate). 25 refs. O.B.D.

[1628]. 12.14.7 : 12.26–8 : 12.19. HAGERUP, O. **The morphology and biology of the *Corylus* fruit.** *Biologiske Meddelelser, Kgl. Danske Videnskabernes Selskab* 17 (6), 1942. pp. 32. 11 refs. [E.] O.R.S.

A detailed study of the morphology and biology of the Hazelnut, with some observations on its dispersal, which is largely effected by birds (*Sitta* and *Picus*) but also by mice and squirrels. As birds try to split open the nuts in crevices of the bark of trees, particularly *Quercus*, this species will often be found to have a vegetation of *Corylus* growing under it. It is suggested that the mixed forest of big Oaks with a luxuriant undergrowth of Hazel, known in so many countries, has in great part grown up and obtained its characteristic composition as a result of the activities of the nuthatch and that the term symbiosis might with some justice be applied to the relationship between the Oak/Hazel community and the nuthatch.

[1629]. 12.14.7 : 12.26–8. RODRIGUEZ, C. Aspectos ópticos en el desarrollo de semillas de *Gleditschia triacanthos* L. **[Visual aspects of the development of seeds of *Gleditsia triacanthos* L.]** *An. Inst. esp. Edafol. Ecol. Fisiol. veg.* 7 (1), 1948 (201–14). 16 refs. [Span.e.] E.M.B.

12.19. Geographical Distribution. Plant Geography and Sociology

See also *For. Abstr.* 10 (Nos. 1628, 1670, 1678, 1683–4, 1847).

[1630]. 12.19 : 02.1. DAUBENMIRE, R. F. **Plants and environment: a textbook of plant autecology.** John Wiley & Sons, Inc., New York: Chapman & Hall, Ltd., London. 1947. pp. xiii + 424. 612 refs. Price 27*s*.

[1631]. 12.19 : 01.7 : 52.46. HUTCHINSON, A. H., and KNAPP, F. M. **Random sampling, planned sampling, and selective sampling: as applied to forest ecology and silviculture.** *Transactions of the Royal Society of Canada* (*Sect.* 5, *Ser.* 3), 40, 1946 (77–9). 5 refs. [University of British Columbia, Vancouver.] L.S.

The following conclusions are drawn: (1) Random sampling is of value only where there are one or two simple variables, but not where many variable ecological factors are involved. (2) Planned sampling, such as strip survey methods, and line-plot surveys, may give statistical evidence of the amount of stocking which has occurred in the past, but gives no valid basis for prediction or for the improvement of restocking, since it takes no account of causal relationships and ecological patterns. Stocked quadrat methods give the most economical system of planned sampling. (3) Selective sampling supplies not only statistical data, but also a basis for the evaluation of the operative forces.

In selective sampling at the University of British Columbia Forest Reserve, plots were selected in timbered and logged areas with Douglas Fir, Western Hemlock or Cedar as the dominant form; in logged, burned regions, plots representing abundant, marginal and sparse restocking of these species were selected. The ecological conditions and growth rates in each of these plots were analysed and evaluated. Strip survey lines were selected to give a series of plots, the axis of which was at right angles to the topographical contour lines.

[1632]. 12.19 (410). TURRILL, W. B. **British plant life.** *New Naturalist Series.* Collins, St. James's Place, London. 1948. pp. xviii + 316. 182 refs. Price 21*s.*

[1633]. 12.19 (66 : 67). CHEVALIER, A. Sur quelques arbres et arbustes d'Afrique tropicale à patrie incertaine. **[Some trees and shrubs of tropical Africa, of which the country of origin is uncertain.]** *Rev. int. Bot. appl. Agric. trop.* 28 (305/6), 1948 (160–7). [F.] P.R.

Discusses the probable country of origin of certain species common to Africa and America and to Africa and Asia.

[1634]. 12.19 : 12.21. COOKE, W. B. **A survey of literature on fungus sociology and ecology.** *Ecology* 29 (3), 1948 (376–82). 20 refs.

A review mainly of the German literature.

[1635]. 12.19 : 12.26–8 (44). DUGELAY, A. L'*Ostrya carpinifolia* dans les Alpes-Maritimes. **[*Ostrya carpinifolia* in the Alpes-Maritimes.]** *Rev. Eaux For.* 87 (6; 7), 1948 (359–68; 425–38 + map). [F.]

A mainly ecological study of a species which, in France, is found only in the Alpes Maritimes.

[1636]. 12.19 : 12.26–8 (436). KEIDEL, B. Rotbuchenvorkommen im Lungau. **[Occurrence of *Fagus sylvatica* in the Lungau.]** *Allg. Forst- u. Holzwirts.-Ztg.* 59 (19/20), 1948 (156–7). [G.]

Records the discovery near Mauterndorf, Salzburg province, of a single, fairly slow-grown but normal 35- to 40-year-old Beech, of natural origin, at the edge of a stand of Norway Spruce, with European Larch and *Alnus viridis.* The species has been regarded hitherto as either lacking or existing only as a crippled tree or two in this area. In view of the present find it is suggested that Beech should be worth trying here, perhaps rather for its value as a soil improver than for its timber.

[1637]. 12.19 : 12.26–8 (969) : 09.1. ST. JOHN, H. **The history, present distribution, and abundance of Sandalwood on Oahu, Hawaiian Islands: Hawaiian plant studies 14.** *Pacific Science* 1 (1), 1947 (5–20). 26 refs. C.G.B.

Recounts the history of the almost complete extermination of Sandalwood, (*Santalum* spp.) in the Hawaiian Islands during the Sandalwood trade in the early 19th century, and discusses the former and present distribution of *S. freycinetianum* on the Island of Oahu. It is now common and widespread at its former upper limit, the present forest line, on the lee side of the Koolau Range and on both sides of the Waianae Mountains.

12.19.1. *Regional Floras, including Check Lists*

[1638]. 12.19.1 (729.88). CHEESMAN, E. E., *et al.* **Flora of Trinidad and Tobago:** Vol. I, pt. 8, pp. 465–532—Umbelliferae, Araliaceae; Index, pp. 533–64. Vol. II, pt. 3, pp. 123–87—Ebenales, Gentianales, Polemoniales (pars). Department of Agriculture, Port-of-Spain, Trinidad. 1947. Price: Index, 60 c., other pts. $1.20 each.

12.19.2-3. *Vegetation Types*

See also *For. Abstr.* 10 (Nos. 1697, 2341, 2367).

[1639]. 12.19.2–3 (46) : 23.21. BURGERS, T. F. Asociaciones de plantas y elección de especies forestales en los terrenos diluviales y aluviales del sur de la provincia de Huelva. **[Plant associations and [natural] selection of forest species on the diluvial and alluvial soils in the south of the province of Huelva.]** *Montes, Madrid* 4 (23), 1948 (393–403). [Span.]

[1640]. 12.19.2–3 (665). ADAM, J. G. Les reliques boisées et les essences des savanes dans la zone préforestière en Guinée française. **[The forest relics and savanna species in the pre-forest zone of French Guinea.]** *Bull. Soc. bot. France* 95 (1/2), 1948 (22–6). [F.] O.B.D.

In the pre-forest zone of French Guinea 3 main types of vegetation are distinguishable: (1) Grassy savanna which has succeeded the original hygrophilous deciduous forest or the intermediate tropophilous forest. (2) Grassy savanna in process of natural repopulation with Sudanese fire-resisting tree species. (3) A few relics of the original deciduous forest, mentioned in (1), all of which are in process of regression. Species found in types (2) and (3) are listed.

[1641]. 12.19.2–3 (669) : 01.2. **The vegetation of Nigeria: descriptive terms.** Forest Department, Lagos. 1948. pp. 34.

The classification here put forward, a modification of that devised by A. P. D. Jones and R. W. J. Keay [cf. *For. Abstr.* 8 (No. 2322)], is to be used as standard in all official reports by forest officers in Nigeria. The classification is illustrated by photographs and profile sketches of the various types. The following standard abbreviations are approved:—HF (high forest), BF (broken forest), 2F (secondary forest), TW (transition woodland), SW (savanna woodland), OS (open savanna).

[1642]. 12.19.2–3 (675). GERMAIN, R. Considérations sur le dynamisme de quelques groupements végétaux de l'Entre-Bomu-Uele. **[The dynamics of certain vegetation types of the Entre-Bomu-Uele.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (823–6). [F.]

[1643]. 12.19.2–3 (675). LÉONARD, T. Contribution à l'étude des formations ripicoles arbustives et arborescents de la région d'Eala. **[Riparian shrub and tree associations of the Eala region.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (863–77). [F.]

[1644]. 12.19.2–3 (675). Contribution à l'étude des forêts équatoriales congolaises. **[The study of the equatorial forests of the Congo [with the aid of profiles].]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (902–15). [F.]

Discusses profiles of the *Scorodophloeus zenkeri* and *Macrolobium dewevrei* types.

[1645]. 12.19.2–3 (675) : 12.19.4. LOUIS, J. L'origine et la végétation des îles du fleuve de la région de Yangambi. **[Origin and vegetation of the islands in the river [Congo] in the Yangambi region.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (924–33). [F.]

[1646]. 12.19.2–3 (763) : 13.15. PENFOUND, W. T. **Vegetation of Lake Chicot, Louisiana, in relation to wildlife resources.** *Abstr.* in *Bull. ecol. Soc. Amer.* 29 (3), 1948 (39–40). [University of Oklahoma.] A.P.B.

[1647]. 12.19.2–3 (764). DYKSTERHUIS, E. J. **The vegetation of Western Cross Timbers.** *Ecol. Monogr.* 18 (3), 1948 (325–76). 82 refs.

A comprehensive ecological study of a belt of woodland 5–50 miles wide, which stretches north and south across the prairies of Texas. It is concluded that the area is within a grassland climate, but that overgrazing has increased the density of the Oak stand (largely by reducing fire hazard) to a point where the landscape approaches that of forest or woodland rather than savanna.

12.19.2. *Forest Types*

See also *For. Abstr.* 10 (Nos. 1583, 1691, 1818, 2341).

[1648]. 12.19.2 (436) : 11.2 : 11.4 : 2 : 64 : 12.19.3. HARTMANN, F. Die niederösterreichischen Donauauen als forstlicher Standort. **[The Danubian bottomlands of Lower Austria as a forest site.]** *Cbl. ges. Forstw.* 70 (1), 1947 (1–38). 5 refs. [G.]

On the basis of his investigations in this region, the author examines the climate, soils, vegetation types, and their interrelationships, and deduces some of the broad lines for silviculture on an ecological basis. The climate and soil climate are warm in summer and inclined to drought. The immature soils are developed over level pebble terraces (calcareous and quartz debris) covered with alluvium, and are rich in mineral nutrient reserves, the availability of which is conditioned by the colloids content (organic matter) of the soil and the degree of weathering, and therefore depends chiefly on soil climate and the biological environment. Considerable local differences occur in the soil types developed. The critical ecological factor is soil climate and especially water régime. On this basis 4 main soil types (described in some detail) and 4 associated vegetation types are distinguished. The latter are: (1) Steppe-type grassland; (2) steppe-type scrub forest; (3) fresh to moist bottomland forests (mixed hardwoods with abundant underwood); (4) swamp forests of the overgrown arms of the river. Great stress is laid throughout on the influence of vegetation and soil organisms on soil development.

Under the conditions of this region, silvicultural mistakes are likely to become evident in due course, e.g. pure Pine plantations in the scrub-forest type lead to accumulation of lime in the lower A horizon, deterioration of soil climate, partial death of tree roots, and hence

to deterioration of the nutrient and water uptake of the Pine, resulting in large-scale mortality in drought years, which enables the natural vegetation to reinvade.

In the moist bottomland forest, removal of the underwood also results in soil deterioration, opening of the canopy and re-invasion by underwood species or by goldenrod [cf. *For. Abstr.* 10 (No. 216)]. Cockchafers also prefer to oviposit in stands with no underwood.

A distinction is drawn between site quality (based chiefly on the more permanent climatic and edaphic factors) and soil fertility (the resultant, at any given stage of development, of all site factors, but largely biotically determined within a given site quality). The forester's task is to promote maximum fertility, and he should be able to manipulate soil temperature, humidity and biological activity in the desired direction by measures, e.g. retention or provision of suitable underwood and shrub layers, to reduce soil temperature and wind in the forest, eliminate excessive competition of grasses for water, provide suitable litter for soil protection and the development of a favourable soil fauna, thus creating an improved moisture and nutrient status. Attention is also drawn to the opportunities afforded by these forests for minimizing root competition by taking proper account of the rooting habits of the various species (choice of species and mixtures, treatment in thinnings, etc.). Only the broadest lines are clear at present and it remains to fill in the detail by further research.

[1649]. 12.19.2 (436) : 11.49 : 64. HARTMANN, F. Durch forstliche Standortsbeurteilung zur forstlichen Produktionssteigerung. **[Through forest site appraisal to increased forest production.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (1/2; 3/4), 1948 (1–4; 20–4). 4 refs. [G.]

Emphasizes the author's conviction that a lasting optimum for both habitat and vegetation is always attained by their interaction, if the natural forest vegetation type develops undisturbed. Illustrates this theme with examples from the Kobernauserwald, Upper Austria, with special reference to the formation and preservation of mild brown forest soils (mull types) under the natural Beech/Silver Fir/Norway Spruce forest, and to the symptoms of degradation (podzolization etc.) that occur on almost all sites where pure Spruce is planted. Even pure Beech gives rise to podzolization on the drier sites, while on fresh sites the soil remains healthy though the deep litter impedes natural regeneration. The situation calls for proper attention to the regeneration of the natural mixed forest and, so far as possible, reconversion of pure Spruce to a similar mixed composition. Sustainment of forest yields cannot be expected if the site is deteriorating, and it is clear that correct ecological appreciation of forest sites should be the basis of silviculture and management.

[1650]. 12.19.2 (471). KALLIOLA, R. Porajärven seudun metsätyypeistä. **[The forest types of the Porajärvi district, [E. Karelia].]** *Commun. Inst. for. Fenn.* 31 (2), 1943 (1–15). 3 refs. [Fi.g.]

With tabulated floristic data for the chief types represented.

[1651]. 12.19.2 (494) : 2. LEIBUNDGUT, H. Aufbau und waldbauliche Bedeutung der wichtigsten natürlichen Waldgesellschaften in der Schweiz. **[Structure and silvicultural significance of the most important natural forest communities in Switzerland.]** Eidg. Inspektion für Forstwesen, Jagd und Fischerei, Bern. 1948. pp. 60 + 4 plates. 33 refs. [G.] Price Fr.1.80 (4s.).

A descriptive review, designed to introduce the practical forester to the general principles of plant sociology as applied to forestry, to summarize the features of all the chief forest types, with lists of characteristic species and brief notes on silviculture, and to guide the reader to more detailed study by bringing together references to important but scattered literature.

[1652]. 12.19.2 (494) : 12.26–8 : 60.32. GRÜNIG, P. Über die Flaumeichenwälder in der Bielerseegegend. **[The *Quercus pubescens* forests in the vicinity of the Lake of Biel.]** *Schweiz. Z. Forstw.* 99 (7), 1948 (394–402). 7 refs. [G.]

Deals with the distribution of the *Querceto-Lithospermetum*, a sub-Mediterranean scrub-forest type of dry, warm, steep S. slopes of the Jura and Valais; its ecological characteristics and successional relationships; site factors; importance, and silvicultural treatment. As this type has practically no direct economic value but is important as protection forest, it is recommended that it should be treated as

selection coppice and that the rich shrub layer should be preserved so far as possible to achieve maximum soil protection.

[1653]. 12.19.2 (665). SCHNELL, R. Note sur les îlots forestiers reliques de la Basse Guinée française. **[Note on the relict forest 'islands' in French Guinea.]** *C.R. Acad. Sci., Paris* 225 (4), 1947 (254–5). [F.] D.S.I.R.

Describes the composition of small patches of forest occurring in the plains and lower mountain slopes. These are considered to be remnants of the original forest.

[1654]. 12.19.2 (676) : 44.0. EGGELING, W. J. **Epiphytes in the Budongo forest.** *Uganda Journal* 12 (1), 1948 (106–7). O.G.

A supplement to the same author's article on the ecology of the Budongo rain forest [cf. *For. Abstr.* 9 (No. 151)]. Includes a table showing numbers of (*a*) ferns, (*b*) orchids, (*c*) other vascular epiphytes found on trees in (1) woodland forest, (2) *Maesopsis* forest, (3) mixed forest, (4) Ironwood [*Cynometra alexandri*] forest. Percentages of trees colonized in these four types were 1·4, 11·7, 16·3, and 22·7 respectively.

[1655]. 12.19.2 (73) : 65. GRIFFIN, C. D. **A study of abundance of stems per acre in relation to age of stand.** *Butler Univ. bot. Stud.* 8, Pap. No. 17, 1948 (219–32). 8 refs. A.P.B.

Data are presented on the number of stems per acre in stands of similar forest type but ranging in age from 10 years to maturity. It was found that a mature floodplain forest carries 25 to 40% more stems per acre than a mature upland forest. It is suggested that the light factor is the chief cause of suppression and elimination in the floodplain forest, whereas in the upland forests it is a combination of light and soil moisture deficiency. *From author's summary.*

[1656]. 12.19.2 (775). STEARNS, F. **Some applications of the use of land survey records in the study of forest communities.** *Abstr.* in *Bull. ecol. Soc. Amer.* 29 (3), 1948 (40). [Purdue University.] A.P.B.

A comparison of undisturbed *Acer saccharum/Tsuga canadensis/Betula lutea* stands in Forest County, Wisconsin, with a reconstruction of the forest cover in 1857–59, obtained from land survey records.

[1657]. 12.19.23 (775) : 12.19.4. WHITFORD, P. B. **Distribution of woodland [herb] species [in Wisconsin hardwood stands] in relation to succession and clonal growth.** *Abstr.* in *Bull. ecol. Soc. Amer.* 29 (3), 1948 (40). [State of Maryland, Department of Research and Education.] A.P.B.

[1658]. 12.19.2 (911) : 12.25 : 21 : 23.1 : 32 : 35 : 60.31 : 61. BAKHOVEN, A. C. Voorkomen en exploitatie van Agathisbosch op Borneo, in het bijzonder wat betreft de houtvesterij Sampit. **[Distribution and exploitation of *Agathis* forest in Borneo, with special reference to the Sampit forest district.]** *Tectona* 35 (1/2), 1942 (4–35). [Du.]

Deals with: reconnaissance of the *Agathis* forests and its results; the habitat of the species in the peat-bog areas; stand composition; natural regeneration; exploitation and disposal of the timber; and the management of the Sampit forests.

12.19.4. *Succession*

See also *For. Abstr.* 10 (Nos. 1645, 1657, 1812–3, 1818, 2341).

[1659]. 12.19.4 : 34.21 (436) : 45.11. ECKMÜLLNER, O. Die Schafweide im Bergwald. **[Sheep grazing in mountain forest.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (21/22), 1948 (171–3). 3 refs. [G.]

In the upper Ennstal sheep are turned out, as soon as the snow disappears, into the forests on sunny slopes near the valley bottoms, i.e. chiefly into relict Pine/*Erica* forest which occurs as a seral stage on immature soils (e.g. dolomitic detritus). There are the barest indications that this type would be succeeded by better ones (Spruce or Oak, according to local climate) if it were not prevented by the sheep. In summer the animals graze, according to the weather, above or below the timberline. Here the original *Piceetum montanum* of soils overlying quartz phyllite is now devastated, consisting of crippled cull trees of Spruce and a dense ground cover of *Vaccinium myrtillus*, with raw humus locally as much as 1 m. thick. This phase represents the combined effects of (former) selective logging and (continued) sheep grazing. If closed to grazing, these areas would revert to forest, a process which could be hastened by burning or by cultivation of *Alnus viridis*, which is an alternate dominant

with Spruce in the natural forest. [Cf. *For. Abstr.* 10 (No. 2256).]

[1660]. 12.19.4 (677) : 44.22. CHEVALIER, A. Déclin de la forêt du Mont-Goudah. (Somalie française). [**The decline of the forest of Mont-Goudah. (French Somaliland).**] *Rev. int. Bot. appl. Agric. trop.* 28 (307/8), 1948 (260–1). [F.] P.R.

The principal tree species surviving in the area are *Juniperus procera*, *Olea chrysophylla*, *Buxus hildebrandtii*, *Moringa peregrina*, *Sideroxylon auberti* and 5 species of *Ficus*. The forest appears to be dying as a result of drought, and the trees are being smothered by both mosses (*Leucodon sciuroides* var. *morensis* and *Leptodon smithii*) and lichens (*Anaptychia leucomelaena* var. *multifida*, *Parmelia proboscidea* and *Usnea* sp.).

12.2. *Special (Systematic) Botany*

12.21. Fungi

See also *For. Abstr.* 10 (Nos. 1906–7).

[1661]. 12.21 (45). PICCO, D. Ricerche sulla biologia dell'*Endothia parasitica* (Murr.) Andersen—in Italia. [**Researches on the biology of *Endothia parasitica* in Italy.**] *Ital. for. mont.* 3 (5), 1948 (254–8). [It.]

Illustrates for the first time the cultural and morphological aspects of the fungus *Endothia parasitica* isolated in Italy. The typical development of the pycnidia and formation of pycnospores confirm experimentally its identity with the American and Asiatic races.

12.25-9. Spermatophyta

[1662]. 12.25–9 (410). WATSON, H. **Botanical notes on trees of the British forests.** Oliver and Boyd, Edinburgh. 1948. pp. 91. 9 refs. Price 8*s*. 6*d*.

Designed to help forestry students to identify the trees which are of importance in British forestry.

[1663]. 12.25–9 (51). CHENG, W. C. **New Chinese trees and shrubs.** *Res. Note For. Inst. nat. cent. Univ., Nanking* (*Dendrol.*). No. 1, 1947. pp. 4. [E.chin.]

Pseudotaxus Cheng, gen. nov., *Pseudotaxus chienii* (Cheng) Cheng, comb nov., *Juniperus pingii* Cheng, sp. nov., *Picea balfouriana* Rehd. et Wils. var. *hirtella* (R. et W.) Cheng, comb. nov., *Beilschmiedia kweichowensis* Cheng, sp. nov., *Altingia multinervis* Cheng, sp. nov.

[1664]. 12.25–9 (54) : 23.27 : 31.0 : 34.2. MCCANN, C. **Trees of India, a popular handbook.** D. B. Taraporevala Sons & Co., Hornby Rd., Bombay. [?1947] pp. [142] + 6 photos, 280 drawings, 138 dgms.

Includes descriptions of 78 species (exotic as well as indigenous) with notes on their use as garden or ornamental trees and the uses of timber, fruit, gums, etc. Each species is illustrated by a coloured drawing of leaf, flower and/or fruit.

[1665]. 12.25–9 (86) : 31.0. LITTLE, E. L., JR. **A collection of tree specimens from Western Ecuador.** *Carib. For.* 9 (3), 1948 (215–98). 27 refs. [E.Span.e.span.]

Describes more than 400 species. Information includes scientific and common names, tree sizes, uses and qualities of wood, habitat, and distribution.

12.25. Gymnosperms

[1666]. 12.25 : 02.1. DALLIMORE, W., and JACKSON, A. B. **A handbook of Coniferae including Ginkgoaceae.** Edward Arnold & Co., London. 3rd ed. (rev.), 1948. pp. 16 + 682 + 40 photos. Price 50*s*.

Includes many additional species and new keys to genera. Uniformity in nomenclature has been aimed at, by making names and authorities agree as far as possible with Rehder and the latest Kew handbook of Coniferae.

[1667]. 12.25 (72) : 31.0 : 33.36 : 34.26. MARTÍNEZ, M. Las Pináceas mexicanas. [**The Pinaceae of Mexico.**] *Anales del Instituto de Biología, México* 16 (1), 1945 (1–352). [Span.] I.I.E.

A comprehensive botanical study with a key to the species. Notes on wood properties, seasoning and preservation, and on resin-tapping are included.

[1668]. 12.25 (72). MARTÍNEZ, M. Los *Cupressus* de México. [**Description, distribution and taxonomy of] the Mexican species of *Cupressus*.**] *Anales del Instituto de Biología, México* 18 (1), 1947 (71–149). [Span.] I.I.E.

[1669]. 12.25 (72). MARTÍNEZ, M. Los *Juniperus* mexicanos. [**[A revision of] the Mexican species of *Juniperus*.**] *Anales del Instituto de Biología, México* 17 (1/2), 1946 (3–128). [Span.] I.I.E.

[1670]. 12.25 (642) : 12.19 : 21. SANCHEZ COZAR, S. 'El Abies del Tazaot'. **['Tazaot Fir'.]** *Montes, Madrid* 4 (21), 1948 (207–19). [Span.] 17 photos.

Describes a new species of *Abies*, named by the author *A. tazaotana*, growing in mixture with *Acer granatensis* along with *Quercus ilex*, *Q. mirbeckii* or *Q. pyrenaica*, on an area of about 1,500 ha. on Mount Tazaot in Spanish Morocco. *A. tazaotana* has many affinities with *A. numidica* and *A. marocana*, but differs from them in its greater height, in the size, shape and anatomy of the leaves and in the size and colour of the flowers. The species appear to have reached its maximum development in this area, conserving the soil and maintaining a thick layer of humus. It grows in a cold temperate climate on Liassic limestone at altitudes between 1,284 and 1,790 m. From measurements made in some plots of 1 ha., selected at random, the volume of trees of timber size averaged 600–800 cu.m., and the trees ranged from 0·40–0·50 m. in d.b.h. and 11–12 m. in height to over 1 m. in d.b.h. and 35–45 m. in height. In the highest parts of the mountain *A. tazaotana* is replaced by *Pinus pinaster*. The author believes that *A. tazaotana* resembles more closely than any other species of this region a primitive form of *Abies*, thought to have existed in N. Africa and Spain in the Miocene period, from which evolved, on the one hand *A. pinsapo*, and on the other *A. marocana* and *A. numidica*.

[1671]. 12.25. TENG, S. C. **Notes on the genus *Metasequoia*** [*M. glyptostroboides* a synonym of *M. disticha* and a member of the Taxodiaceae]. *Bot. Bull. Acad. sinica* 2 (3), 1948 (204–6). 7 refs.

Cf. *For. Abstr.* 10 (No. 1854).

[1672]. 12.25 : 12.14.5. ŽOFAK, D. Studium morfologických a anatomických vlastností listů rodu *Pinus*. **[Study of the morphological and anatomical features of the needles of the genus *Pinus*.]** *Abstr.* in *Acta Facultatis Rerum naturalium Universitatis Carolinae* No. 174, 1947 (53–9). [Cz.russ.]

Includes a key, based on anatomical needle characters, to the Pines of Europe, Caucasia and Asia Minor.

12.26-8. Dicotyledons

[1673]. 12.26–8 (596–9). GAGNEPAIN, F. Genres nouveaux, espèces nouvelles d'Indochine. **[New genera and species from Indo-China.]** *Bull. Soc. bot. France* 95 (1/2), 1948 (26–34). [F.] O.B.D.

Includes *Poilanedora unijuga* gen. et sp. nov. (Capparidaceae), *Perissandra laotica* gen. et sp. nov. (Violaceae), *Taraktogenos floribunda* sp. nov., *Paranneslea donnalensis* gen. et sp. nov. (Ternstroemiaceae), and *Brachypodandra chevalieri* gen. et sp. nov. (Tiliaceae).

[1674]. 12.26–8 (88). MAGUIRE, B., *et al.* **Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur plateau—IV.** *Bull. Torrey bot. Cl.* 75 (4), 1948 (374–438). O.B.D.

Includes descriptions of the following new species:—*Licania parvifructa, L. persandii, Couepia exflexa, C. villosa, Hirtella caduca, H. subsetosa, Inga leptingoides, I. calanthoides, Macrolobium stenopetalum, M. longeracemosum, Andira grandistipula, Simaba alata, Discocarpus mazarunensis, Croton nuntians, Dodecastigma mazarunense, Clusia stylosa, C. mutica, C. lunanthera, Tovomita divaricata, T. fanshawei* and *Rheedia martinii*.

[1675]. 12.26–8 : 12.13 : 12.14. MAGINI, E. Il riconoscimento delle piantine allo stato giovanile. (B) Il riconoscimento delle piantine di latifoglie. **[The identification of seedlings in an early stage of development. (B) The identification of broadleaved seedlings.]** *Ital. for. mont.* 3 (5), 1948 (310–5). [It.]

Cf. *For. Abstr.* 10 (No. 114).

[1676]. 12.26–8 (666.8). CHEVALIER, A. Une arbre remarquable de la forêt de la Côte d'Ivoire: *Assidora problematica*. **[A remarkable tree from the forest of the Ivory Coast: *Assidora problematica*.]** *Rev. int. Bot. appl Agric. trop.* 28 (309/10), 1948 (352–3). [F.] P.R.

[1677]. 12.26–8 (672.1). PELLEGRIN, F. Les Annonacées du Gabon. III. *Pachypodanthium, Letestudoxa, Annona, Uvariopsis, Hexalobus, Enantia*. **[The Annonaceae of**

Gabon: III. *Pachypodanthium, Letestudoxa, Annona, Uvariopsis, Hexalobus, Enantia.*] *Bull. Soc. bot. France* 95 (3/4), 1948(136–41). [F.] O.B.D.

[1678]. 12.26–8 : 12.19 : 34.25. CHEVALIER, A. Le genre *Holarrhena* et sa distribution géographique. [**The genus *Holarrhena* and its geographical distribution.**] *Rev. int. Bot. appl. Agric. trop.* 28 (305/6), 1948 (115–20). [F.] P.R.

Cf. *For. Abstr.* 10 (No. 2161).

[1679]. 12.26–8 (969). SHERFF, E. E. **A preliminary study of Hawaiian species of the genus *Rauvolfia* (Plum.) L. (Family Apocynaceae).** *Bot. Ser. Field Mus. nat. Hist.* 23 (7), 1947 (321–31 + 1 drawing). (*Field Mus. Publ.* No. 613.)

[1680]. 12.26–8 (51). P'EI, C. **Flowering plants of northwestern China, II.** *Bot. Bull. Acad. sinica* 2 (4), 1948 (215–27).

Betula spp., *Carpinus* spp., *Ostryopsis davidiana*, *Corylus* spp.

[1681]. 12.26–8 (678). DUNKLEY, H. L., and BRENAN, J. P. M. ***Platypterocarpus*, a new tree genus of Celastraceae from Tanganyika.** *Kew Bull.* No. 1, 1948 (47–50).

Platypterocarpus tanganyikensis, a single species of a new genus, is described. The tree is found in Tanganyika Territory in mixed stands in the transition zone between wet and dry forest. It is up to 25 m. tall, having in some cases upwards of 12 m. of clear stem. The wood is dark red and, when cut into boards, cups badly on drying.

[1682]. 12.26–8. SHERFF, E. E. **Further studies in the genus *Dodonea*.** *Bot. Ser. Field Mus. nat. Hist.* 23 (6), 1947 (269–317). (*Field Mus. Publ.* No. 612.)

[1683]. 12.26–8 (82) : 12.19 : 12.14. BURKART, A. Las especies de *Mimosa* de la flora Argentina. [***Mimosa* species of the Argentine flora.**] *Darwiniana, B. Aires* 8 (1), 1948 (9–231 + 2 plates). [Span.] O.B.D.

A comprehensive study of the Argentine species of *Mimosa*, including some new species, varieties and forms. A brief consideration of their economic value and some notes on the taxonomy, morphology and biology of the genus are followed by a key to the genus and a morphological description of each species, with an account of its distribution within Argentina.

[1684]. 12.26–8 (82) : 31.0 : 12.19 : 01.2 : 65. TORTORELLI, L. A. **The Argentine *Piptadenia* timbers.** *Trop. Woods* No. 94, 1948 (1–27 + 19 photos).

A study of the most important Argentine species of *Piptadenia—P. macrocarpa, P. excelsa, P. rigida* and *P. paraguayensis*—including for each a botanical description, nomenclature and distribution, and the appearance, anatomy and uses of the timber. Statistics from sample plots illustrate the proportion of associated species, the average measurements of the *Piptadenia* spp., and the average and maximum number per ha. of trees larger and smaller than 30 cm. in diameter. [Cf. *For. Abstr.* 10 (No. 1705).]

[1685]. 12.26–8. HERMANN, F. J. **Studies in *Lonchocarpus* and related genera: I. A synopsis of *Willardia*. II. Miscellaneous Middle American *Lonchocarpi*. III. *Humboldtiella* and *Callistylon*.** *J. Wash. Acad. Sci.* 37 (12), 1947 (427–30). 5 refs; 38 (1; 2), 1948 (11–4; 72–5). A.P.B.

[1686]. 12.26–8 (729) : 12.14. HOWARD, R. A. **The morphology and systematics of the West Indian Magnoliaceae.** *Bull. Torrey bot. Cl.* 75 (4), 1948 (335–7). O.B.D.

[1687]. 12.26–8. KOBUSKI, C. E. **Studies in the Theaceae, XVII. A review of the genus *Bonnetia*.** *J. Arnold Arbor.* 29 (4), 1948 (393–413).

12.29. Monocotyledons

[1688]. 12.29. RAIZADA, M. B. **A little known Burmese Bamboo.** *Indian For.* 74 (1), 1948 (7–10).

The author proposes to transfer *Bambusa copelandi* (of which he gives a general description) to the genus *Sinocalamus* as *S. copelandi* (Gamble) Raizada.

13. FOREST ZOOLOGY

See also *For. Abstr.* 10 (Nos. 1646, 2259 *et seq.*).

[1689]. 13.2 : 13.15 : 45.3. BRUES, C. T. **Insects and human welfare: an account of the more important relations of insects**

to the health of man, to agriculture, and to forestry. Harvard University Press, Cambridge, Mass. Rev. ed., 1947. pp. xiv + 154. Price 14*s*.

An attempt to present some of the principles and practices of economic entomology in a form that will illustrate the biological relationships of insects to their environment. One chapter is devoted to forest insects.

[1690]. 13.2 (410). CHRYSTAL, R. N. **Insects of the British woodlands.** F. Warne & Co., Ltd., London & New York. Reprint with supplement. 1948. pp. 370. 55 refs.

Supplementary matter includes:—(1) a key for the identification of insect and allied damage to buds, shoots, foliage, seeds, etc. of conifers and hardwoods; (2) key to types of damage by insect borers; (3) synopses of the forest relations of sucking insects, of defoliators, of bark- and wood-boring insects, and of insect predators and parasites.

[1691]. 13.2 : 13.15 (666.8) : 12.19.2 : 45.3 : 11.43.2. PAULIAN, R. Observations écologiques en forêt de basse Côte d'Ivoire. [**Ecological observations in the forest of the Lower Ivory Coast.**] Encyclopédie biogéographique et écologique. Vol. 2, 1947. pp. 148 + 6 photos. 141 refs. [F.] P. Lechevalier, Paris. Price 600 frs. (16*s*. 6*d*.).

A detailed ecological study of the insect fauna of the tropical rain forest of the Ivory Coast [cf. *For. Abstr.* 8 (No. 977)], with particular reference to insect attack on trees. A clear division is made between the fauna of the forest itself and that of forest glades, the former being subdivided into fauna of (*a*) the soil, (*b*) the intermediate zone, (*c*) the canopy, and the latter into fauna of (*a*) the soil, (*b*) the low grassland, (*c*) the air, (*d*) the forest edges. From these ecological studies, an attempt is made to analyse the origins of the African fauna.

From the special study of infested trees, it is concluded that insects attack only sick or dying trees. In forest glades attack commences in the 2 hours following an injury, while the wound is still bleeding, and during the 48 hours following death from fire. Under forest cover, the attack may not commence until several weeks or months later, which favours exclusively mycobacterial infestations. When there is bleeding of sap, insects arrive in the following order:—Drosophilidae, Muscidae, Nitidulidae, Histeridae, Platypodidae, Cerambycidae, predatory Hemiptera, Brenthidae. When there is no bleeding of sap, the order is markedly different: sepedophiles such as the Diptera and Histeridae, microphages such as the Scaphidiidae, arrive at the same time as the first xylophages, which thereafter arrive in increasing numbers. In short, the order of arrival agrees neither with the ecological order suggested by Graham nor with the logical order postulated by Eidman. Eidman's observations are valid only for trees felled in a dense underwood.

[1692]. 13.2 (54). GARDNER, J. C. M. **A list of described immature stages of Indian Coleoptera.** *Indian For. Rec.* (*n.s.*) *Entomology* 7 (5), 1948. pp. 191.

[1693]. 13.2 : 13.15. DAGGY, T. **The importance of large field collections, and the analysis of data for constructing life cycles of wood-inhabiting Coleoptera.** *Abstr.* in *Bull. ecol. Soc. Amer.* 29 (3), 1948 (48). A.P.B.

[1694]. 13.2 (44). BERLAND, L. Faune de France. 47. Hymenoptères tenthredoides. [**The fauna of France: 47. Hymenoptera, Tenthredinoidae.**] P. Lechevalier, 12 Rue de Tournon, Paris 6. 1947. pp. 496. 21 pp. of refs. [F.]

[1695]. 13.2 : 13.15 (411–4) : 23.3. VENABLES, L. S. V., and VENABLES, U. M. **A Shetland bird population: Kergord plantations.** *J. Anim. Ecol.* 17 (1), 1948 (66–74 + 2 photos). 13 refs.

The largest area of woodland on Shetland is at Kergord, Weisdale, where some 8–9 acres of mixed plantations are growing well. The dominant species are *Acer pseudoplatanus*, *Larix leptolepis* and *Picea sitchensis*. In addition to a report on bird ecology, the authors give a short history of the plantations with a list of tree and shrub species.

[1696]. 13.2 : 13.15 (756) : 22.88. ODUM, E. P. **Effect of logging on the bird and mammal population of a Southern Appalachian virgin Hemlock forest.** *Abstr.* in *Bull. ecol. Soc. Amer.* 29 (3), 1948 (47–8). A.P.B.

The absolute abundance of breeding birds and the relative abundance of mammals during

June of 3 successive years (1946–8) have been studied on an area of undisturbed virgin Hemlock forest and a nearby area of the same forest logged in 1945. The forest is situated on the Highlands, North Carolina Plateau, at an altitude of 4,000 ft. The total bird population was somewhat greater on the logged area and was quantitatively different. Of the seven most abundant species in the virgin forest, 3 understorey species remained prominent in the logged area and 4 overstorey species were largely or entirely replaced by early seral species. Small mammals of the soil appear to be the same up till now in both areas. By the third year, however, rabbits had increased and red squirrels decreased on the logged area.

2. SILVICULTURE

See also *For. Abstr.* 10 (Nos. 1648–9, 1651–2, 1658).

[1697]. 2 : 02.1 (46) : 12.19.2–3. González Vázquez, E. Selvicultura. Libro primero. Fundamentos naturales y especies forestales. Los bosques ibéricos. **[Silviculture. Volume I. Fundamental natural laws and forest species. The Spanish forests.]** Editorial Dossat, S.A., Madrid and Buenos Aires. 2nd ed., 1947. pp. xvi + 575 + 1 dgm. + 1 map. [Span.] Price 125 pesetas (£3 16*s.*).

This first volume of what will finally be a comprehensive treatise on silviculture, consists of a study of fundamentals, and is divided into two parts. Part I contains chapters on the formation of plant associations, the forest stand, its characteristics, natural evolution and constitution, natural stands and their constitution, silvicultural systems and forms of forest, choice of species for afforestation, and forest types. Part II deals with the Spanish forests in particular, their history, extent and composition, silvicultural characteristics of native species, forest types in Spain and the natural distribution of the country's forests. An appendix gives a brief description of exotic species suitable for introduction into Spain.

[1698]. 2 : 02.1 : 12.19.11. Toumey, J. W., and Korstian, C. F. **Foundations of silviculture upon an ecological basis.** John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London. 2nd ed. (rev.), 1947. pp. xxi + 468. Many refs.

[1699]. 2 (493) : 07.2 : 11.2 : 11.4 : 12.19 : 44.3 : 45.3. Boudru, M. Le progrès scientifique et la sylviculture. **[Scientific progress and silviculture.]** *Annales de Gembloux* 53 (4), 1947 (233–60). 71 refs. [F.] C.G.B.

A review of recent advances in climatology, ecology, soil science, entomology and pathology and their application to silviculture, with special reference to Belgian forests.

[1700]. 2 (675). Gilbert, G. Considérations générales sur la sylviculture au Congo Belge. **[General considerations on silviculture in the Belgian Congo.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (878–87). [F.]

[1701]. 2 (769) : 09.7 : 6 : 90. Duerr, W. A., and Gustafson, R. O. **Management of forests in an Eastern Kentucky area.** *Bull. Ky. agric. Exp. Sta.* No. 518, 1948. pp. 122.

[1702]. 2 : 12.25 (469) : 81. Cromer, D. A. N. **The wild Pine tree in Portugal.** *Aust. For.* 12 (1), 1948 (47–55). 4 refs.

Brief notes on the silviculture of *Pinus pinaster* in Portugal, and the activities of the Portuguese Forest Service.

[1703]. 2 : 12.25 : 12.26–8 (46). Burgers, T. F. Algunas experiencias sobre la conservación de los bosques en clima seco. **[Some experiments in the care of forests in a dry climate.]** *Montes, Madrid* 4 (22), 1948 (313–6). [Span.]

Rainfall and temperature in the 'Forestal de Villarejo', where *Eucalyptus globulus* and *Pinus pinea* are being grown [cf. *For. Abstr.* 9 (Nos. 193–7)] are only just within the limits required by *E. globulus*, which needs a temperature never below 5° C. and an annual rainfall of 600 mm. The soil of these stands, which is mainly diluvial and alluvial sand, is ploughed before and after planting, in order to maintain a loose top soil of good depth and conserve soil moisture by reducing run-off. The annual increments in *E. globulus* plantations, (1) established in

1930–4 and ploughed several times, (2) established in 1935–6 and ploughed 4 times in all, and (3) established in 1937–45 and ploughed not more than twice, showed a marked falling-off where ploughing was neglected. *P. pinea*, which is native to the region, was sown direct and given one or two timely and intensive thinnings to a density not exceeding 1,000–1,500 trees per ha. *E. globulus* was planted at a spacing of 4 × 4 m., giving about 625 trees per ha. This number usually declined to 300–400 by slow but continuous mortality.

Selection instead of clear felling is preferred, since it avoids too swift evaporation of moisture from the soil and helps to protect the stand against invasion by undesirable species. Pruning is necessary, particularly for *P. pinea* which tends to develop branches as thick as the trunk. Measurements of growth in *E. globulus* trees pruned 'high' and 'low' showed that greater volument increment is obtained with 'low' pruning.

[1704]. 2 : 12.26–8 (68) : 34.24 : 57. SHERRY, S. P. **The silviculture of Black Wattle (*Acacia mollissima* Willd.).** *Bull. Dep. Agric. S. Afr.* No. 31, 1947. pp. 72. 67 refs.

The history and development of the Wattle industry in South Africa is outlined briefly, and site and climatic requirements for successful commercial Wattle culture are discussed. The silvicultural treatment of Black Wattle (*Acacia mollissima*) is discussed in detail in the light of results from work carried out by officers of the Research Branch of the South African Department of Forestry during the past 18 years. On the basis of these results and of practical experience, silvicultural recommendations, designed to give optimum results in commercial practice and supply present-day demands, are made.

A timber volume table and bark yield table for Black Wattle in Natal are presented, together with graphs for the assessment of bark quality, in terms both of thickness and of % tannin content, and for estimation of tree size and bark yield at different densities and ages.

The economic aspects of the Wattle industry are discussed and brief summaries of the results obtained by workers in the fields of entomology, pathology, and genetics in relation to Wattle culture are included.

A note on Green Wattle (*Acacia decurrens*) is given to indicate why this species is no longer being planted commercially. *Author's summary.*

[1705]. 2 : 12.26–8 (81) : 31.0. HERNIGER, E. P. Cultura do angico vermelho (*Piptadenia peregrina*, Benth.). [**The cultivation of *Piptadenia peregrina*, Benth.**] *Bol. Minist. Agric., Rio de J.* 34 (9/12), 1945 (1–21). [Port.]

A botanical description of *Piptadenia peregrina*, with recommendations for its cultivation and use. Seed should be collected from trees about 10 years old and sown early, as it has poor viability. The dry season up to September 15 is best. A sheltered, but airy, sunny site should be chosen, preferably somewhat sloping for drainage. The soil should be well prepared, with the seedbeds wide enough to permit 10 rows of seed, spaced at 10-cm. intervals. The seedbeds need a light top dressing of manure and must be protected from the sun by means of laths, matting or hay. Seedlings are transplanted in wet weather between December and March, or from October to December of the following year. Part of the main root is pruned, leaving about 25 cm. The planting espacement depends upon the terrain, but 3 m. is recommended. Where possible the ground should be ploughed beforehand; on agricultural land *P. peregrina* can be planted out in association with millet or cassava. Three cleanings a year are necessary until the trees are well established, with pruning twice a year. The tree is tolerant of dry and infertile soils [cf. *For. Abstr.* 7 (No. 529)], though it flourishes in fertile ones.

Data on the physical and mechanical properties of the timber, and stand tables from a 4-year-old plantation are presented. The tree can be used to produce firewood, constructional and saw timber, poles, tannin and charcoal and it can be grown as a shade tree for coffee, for hedging, soil improvement and erosion control and for gum. [Cf. *For. Abstr.* 10 (No. 1684).]

[1706]. 2 : 12.26–8 : 31.0 : 47 : 5 : 05.4. Das Pappeljahrbuch 1947. [**The Poplar yearbook, 1947.**] Gesellschaft für forstliche Arbeitswissenschaft e.V., and 'Lignikultur, Gesellschaft für Holzerzeugung ausserhalb des Waldes e.V.' (Verlag M. & H. Schaper, Hannover.) 1947. pp. 150 + 9 plates. 57 refs. [G.]

A symposium in 3 parts:—(1) Papers on: Species of and silvicultural systems for Poplar (*H. H. Hilf*); Poplar for pulp, its cultivation and breeding (*W. von Wettstein*); Organization of Poplar propagation (*E. G. Strehlke*); Poplar-growing in Holland (*G. Houtzagers*); The fertilizing of Poplars (*R. B. Hilf*); Yield of Poplars outside the forest (i.e. as roadside trees, etc.), and a Volume table for well pruned, narrow-crowned Poplars (*B. Schmitz-Lenders*); Increased Poplar-growing from the point of view of the timber industry (*B. Heil*); Animal pests of Poplar (*H. Schmidt*).

(2) Notes, reviews, and a select bibliography of literature quoted in all 3 sections of the year-book.

(3) Information in conspectus and tabular form on systematic botany and identification; yield, form factors and volume tables; properties and uses of the wood; and silvicultural questions. Many of these are taken from literature; some are new and are to be regarded as provisional.

[1707]. 2 : 12.26–8 : 12.11.3. GUINIER, P. Les peupliers du point de vue botanique et sylvicole. **[Poplars from the botanical and silvicultural points of view.]** *Schweiz. Z. Forstw.* 99 (7), 1948 (363–79). [F.g.]

A general review.

[1708]. 2 : 12.26–8 (410) : 31.0 : 47. **Poplar planting.** *Leafl. For. Comm., Lond.* No. 27, 1948. pp. 14.

Gives a brief outline of the cultivation, diseases and pests, and the utilization of Poplar. The whole subject will be dealt with more fully in a subsequent publication.

[1709]. 2 : 12.26–8(494) : 31.0 : 47. BARBEY, A. Die Pappel: ihre Nützlichkeit und die Ausdehnung ihres Anbaus in der Schweiz. **[Poplar: its utility and the extension of its cultivation in Switzerland.]** Inspektion für Forstwesen, Jagd und Fischerei, Eidg. Departement des Innern, Bern. 2nd ed. (rev.), 1947. pp. 57. 8 refs. [G.]

Cf. *For. Abstr.* 7 (No. 148).

[1710]. 2 : 12.26–8 (45) : 06.2 : 12.11.3 : 47. HOUTZAGERS, G. Rapport betreffende het 2e Internationale Congres inzake de Populierenteelt, gehouden in Italie van 20–29 April 1948. **[Report on the 2nd International Congress on Poplar-growing held in Italy, 20–29 April, 1948.]** *Ned. Boschb.-Tijdschr.* 20 (7), 1948 (193–205). [Du.]

The hybrid Black Poplars seen in N. Italy appear to represent a whole series of forms between *Populus angulata* and *P. nigra*, most of them resembling the latter species more closely. Poplars are grown in N. Italy mainly along the borders of agricultural land, which is often irrigated. Here they are generally pruned too high and planted very close (often spaced only 2–3 m.). The usual rotation is 12–15 years, in which time the trees attain a diameter of 30–35 cm. Italy has about 30,000 ha. under forest stands of Poplars, furnishing about one-third of the annual Poplar outturn of some 1 million cu.m., the remaining two-thirds coming from trees along field borders, roads, etc. No Poplar canker was seen on the excursions. The disease causing most concern in Italy is 'spring defoliation' [cf. *For. Abstr.* 2 (121)]. Insect damage is sufficiently severe for particular attention to be paid in the Italian Poplar-breeding programme to resistance against such attacks. The native species *P. nigra*, *P. alba* and *P. alba nivea* are believed to offer most promise in this respect. Poplar breeding is carried on by the forest experiment station at Florence and at the Istituto per la Sperimentazione della Pioppicultura at Casale Monferrato, a private institution belonging to Cartiere Burgo Ltd.—the biggest pulp and paper firm in Italy. So far no controlled crossings have been made, but only selection from the progeny of open-pollinated trees. Propagation is by cuttings about 20 cm. long, often stood in water for several days before planting, a treatment said to reduce mortality. Cuttings are planted, preferably in autumn, 7–10 cm. apart. After one year's growth they are stumped and transplanted at a spacing of 40 cm. in, and 1·6–2 m. between, the rows. During the first of the subsequent 2 years which the transplants spend in the nursery, a row of first-year plants can be raised between each 2 rows of transplants. At the end of their second season as transplants, the plants are lifted and sold in 3 grades by girth (8–10 cm., 10–14 cm., over 14 cm.), being pruned of all lateral shoots and of much of their roots. These pole-like plants [apparently about 15 ft. tall] are set deep to encourage adventitious rooting from the stem; if a 'forest' plantation is made, they are spaced 3·5–3 m. in the rows and the rows are wide enough apart to permit

the raising of crops such as maize and lucerne for the first few years. Autumn is preferred to spring planting.

The International Poplar Commission which organized the Congress has become a Technical Commission of FAO.

[1711]. 2 : 12.26–8 (45) : 33.32 : 12.11.3. HERBIGNAT, A. Commission internationale du peuplier, 2e Congrès, du 20 au 28 Avril 1948. **[The 2nd Congress of the International Poplar Committee, 20–28 April 1948.]** *Bull. Soc. for. Belg.* 55 (9), 1948 (336–65). [F.]

A fairly detailed account, based on notes taken in the course of the tour in Northern Italy which included visits to Poplar plantations and pulp and paper factories. The subjects covered include hybridization, methods of propagation, silvicultural treatment, and pulp manufacture.

[1712]. 2 : 12.26–8. HUTCHINSON, H. P. **Problems in Bat Willow [*Salix alba* var. *caerulea*] culture described in detail.** *Quart. J. For.* 42 (4), 1948 (197–9).

[1713]. 2 : 12.29. **Management of Bamboo forests.** *Rep. For. Dep. Mysore 1942–3*, 1948 (34–5).

Observations made during 7 years on experimental plots in Bamboo areas of the Bhadravati division, have established the following facts:—(1) Clear felling kills all clumps of the small Bamboo [*Dendrocalamus strictus*] but the large Bamboo, [*Bambusa arundinacea*], though it suffers from clear felling, does not die outright. (2) A 3-year cycle is possible for the large Bamboo, but the small Bamboo requires 4 years in heavy rainfall areas and 5 years in lower rainfall areas. (3) Removal of more than $\frac{1}{4}$ of the culms from each clump of small Bamboo in the better-quality forests, and of more than $\frac{1}{3}$ in poorer-quality is inadvisable. Removal of as many as $\frac{1}{2}$ of the culms does not injure large Bamboo. (4) Every thinning of a Bamboo clump within the limits specified above, or even the removal of dead culms, leads to the production of a larger number of culms than usual, provided that the seasonal rainfall is normal. (5) Removal of overhead canopy stimulates growth and increases the number of culms produced. (6) The duration of life of a clump of small Bamboo is at least 6 years; that of the large Bamboo is more. With rigid fire exclusion both species live much longer. (7) Flowering can be neither hastened nor delayed by exploitation, whatever its intensity.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

See also *For. Abstr.* 10 (Nos. 1658, 1670, 1741–2, 1753, 1808, 1847).

[1714]. 21 : 12.26–8 : 31.0. FLAMIGNI, A. L'arbre 'Bonkenyama', *Morus mesozygia* Stapf. **[The Bonkenyama tree.]** *Bull. agric. Congo belge* 39 (3), 1948 (593–600). 1 ref. [F.]

A general account, including structure, anatomy and identification of the wood.

[1715]. 21 : 12.26–8 (676) : 91.4 : 23.34. **[*Eucalyptus saligna.*]** *Rep. For. Dep. Uganda 1947*, 1948 (17).

In the Kabale swamp plantations, seedlings of *Eucalyptus saligna* grew as fast as coppice *E. robusta*. This confirms experience elsewhere in Uganda that *E. saligna* is almost always a better choice than *E. robusta* both for swamp and dry sites. Swamp planting, however, is seldom economic and should be resorted to only if no alternative site is available or if a plantation must be established for anti-malarial reasons.

[1716]. 21 : 12.26–8 (74) : 22. COPE, J. A. **White Ash management possibilities in the northeast.** *J. For.* 46 (10), 1948 (744–9). 14 refs.

The advantageous silvicultural characteristics of *Fraxinus americana* include frequent and ample seed crops, not too exacting seedbed requirements, rapid height growth and self-pruning. To assure a high proportion of this species, clear cutting is necessary, and a system of harvesting by strips, group or blocks is recommended, in order to provide for continuity of operations.

21.0. *Adaptability to the General Environment. Acclimatization*

See also *For. Abstr.* 10 (Nos. 1620, 2214).

[1717]. 21.0 (436). SCHWARZ, H. Die ausländischen Holzarten in der österreichischen Forstwirtschaft. **[Exotic tree species in Austrian forestry.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (5/6), 1948 (45). [G.]

Lists exotics in 3 groups according to the extent of knowledge of their value in Austria, indicating for each species the climatic zone to which it appears best suited.

[1718]. 21.0 (437) : 12.25. ŽABKA, J. Pokusné pěstění duglasky na Křivoklátsku, Hořicku a Plzeňsku a biologické i pěstební poznatky z něho vyplývající. [**Trials of Douglas Fir in the Křivoklát, Hořice and Pilsen districts, and the biological and silvicultural information gained from them.**] *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (111–37). [Cz.cz.russ.e.] [Ústav pěstění lesů a lesnické biologie, Brno.]

Gives an account of trial plots, established in 1902–5 by the Mariabrunn Forest Research Station, of 'green' Douglas Fir (seed origin unknown). Growth has been vigorous in most of the localities. Resistance to fungus and insect damage cannot yet be assessed. In youth there were severe setbacks in some stands by drought and early or late frosts. Later, in 1929, the polewood and older stands stood prolonged winter frost well. In 1939–40 much snow breakage occurred as a result of heavy, early snowfalls, but native species suffered too. At 34 years of age the best plots of Douglas Fir were 4·5–5·4 m. taller than Norway Spruce of the same age and site quality. The best initial spacing for plantations appeared to be 1·0 × 1·25 m., though 1·3 × 1·3 m. was also satisfactory. The first thinnings, made much too late (at 25–31 years), resulted in greatly increased increment. Plots at Hudlice which, after the first heavy thinning, were moderately thinned every 3 years, and in which some green pruning was done, showed very satisfactory growth and stem form. Early, moderate and frequent thinning should be the rule; heavy thinnings should be avoided on account of the risk of windthrow and snow breakage.

Further research is desirable on the effects of thinnings, on the suitability of different provenances, the possibility of cork production from thick-barked varieties, and the use of the species in mixtures.

[1719]. 21.0 (489) : 12.25 : 12.11.3. BORNEBUSCH, C. H. **Experiments with Polish Larch in Denmark.** *Sylwan* 92 (1), 1948 (8–21). [E.Pol.]

The Danish Forest Experiment Station in 1930 received 1 kg. of seed of *Larix decidua* var. *polonica* collected from the state forests of Zagnańsk (lat. 50° 52′ N., long. 20° 36′ E.) at an altitude of 300 m. Transplants raised from this seed were planted out in experimental areas in Jutland and Zealand and their growth and survival are compared with those of comparable plots of European Larch from Siberia, Switzerland and Scotland, and Japanese Larch from Japan and Korea. The Polish strain proved much superior in growth to the Scottish, and in form to the Japanese Larch. The Scottish and Swiss strains were definitely inferior. The Korean Larch is of good form but very susceptible to infection from *Polyporus annosus*. In later trials, seed was obtained from Góra Chelmowa from very crooked trees, and this character was transmitted to their progeny in Denmark. A parcel of seed from Skarżysko, on the other hand, resulted in rapid growing, well formed trees. Data are given from measurements of the various plots mentioned above. It is tentatively concluded that Larch from the Sudetic-Carpathian area is definitely more vigorous than that from the Alpine-Austrian area. While the Alpine and, to a less degree, the Scottish Larches, when cultivated in Denmark, show a great susceptibility to canker, stock from the Sudetic-Carpathian area and the variety *polonica* seem to be definitely resistant. [Cf. *For. Abstr.* 8 (No. 174); 10 (No. 790).]

[1720]. 21.0 (676) : 12.25. [**Exotic softwoods in Uganda.**] *Rep. For. Dep. Uganda 1947*, 1948 (24).

Height increment of *Cupressus lusitanica* is 4–6 ft. a year. A trial planting at 8,000 ft. on land cleared of Bamboo grew very fast. Planting among the Bamboo was not a success. Experience to date indicates that *C. macrocarpa* is doubtfully worth growing, and that *C. arizonica* shows little promise. *C. torulosa* will probably be useful on restricted stony sites. *Pinus canariensis* and *P. radiata*, planted in 1946, made no growth till the soil was inoculated in 1947.

[1721]. 21.0 (676) : 12.26–8. [***Gmelina arborea* as a pole and fuel species.**] *Rep. For. Dep. Uganda 1947*, 1948 (24–5).

Small experimental plots were laid out at Mbale in an attempt to discover alternative pole and fuel species to *Cassia* and *Eucalyptus*. So far, *Gmelina arborea* is the most promising of those tried. Stump plants put out in April,

and kept clean-hoed, were 5½ ft. high by the end of the year.

[1722]. 21.0 (681) : 12.26–8 : 60.2. **[Pole plantations in Bechuanaland.]** *Rep. For. Dep. Bechuanald. 1947*, 1948 (1–3).

Pole and fuel plantations are now well established. Of the older stands, *Eucalyptus rostrata* are the best; younger plantations showing promise are *E. tereticornis* and *E. maideni*. *E. citriodora*, killed back by frost, coppices and then makes a good straight pole. *E. polyanthemos* provides strong tool handles, but not useable poles. The following species have been failures and are no longer planted: *E. saligna*, *E. melliodora*, *E. sideroxylon*, *E. paniculata*, *E. maculata*, *Pinus halepensis*, *Casuarina cunninghamiana*, and *Callitris arenosa*.

The savanna fuel experiment was continued. The older Eucalypts are now dominating the indigenous trees, but the Casuarinas (*C. cunninghamiana*) are almost stagnant after a good beginning.

[1723]. 21.0 (763) : 12.25. Muntz, H. H. **Slash Pine versus Loblolly in Central Louisiana.** *J. For.* 46 (10), 1948 (766–7).

Comparison of 10-year-old experimental plantations of *Pinus taeda* and *P. caribaea* showed a significant superiority for the former in survival, height and diameter growth, and resistance to rust and ice damage.

[1724]. 21.0 (776) : 12.25 : 56. Roe, E. I. **Tamarack—promising species for Minnesota.** *Conserv. Volunteer* 11 (64), 1948 (49–50). [Lake States Forest Experiment Station, University of Minnesota.] B.A.P.

Recent measurements made at the experimental plantations in the Kawishiwi Experimental Forest, Minnesota, show that Tamarack [*Larix laricina*] grows, on an average, as fast as Jack Pine [*Pinus banksiana*]. On one plot, where 2-year seedlings were established at 4 × 4 ft. spacing in May, 1937, Jack Pine (13 years from seed) averaged 15·1 ft. in height and Tamarack 15·0 ft., but the maximum height for Tamarack averaged 19·1 ft., compared with 17·7 ft. for Jack Pine. Survival of Tamarack was 69%, and of Jack Pine 62%. On a plot on lower ground, also spaced at 4 × 4 ft. and planted in 1937 with 2-year transplants, the largest Tamarack was 3·8 in. d.b.h. and 26 ft. in height. Another Tamarack had a d.b.h. of 4 in. Tamarack is a useful timber for fence posts and rough building components, as well as for pulpwood and mining timbers, and would repay planting on the wet waste areas common to many farms in the wooded area of Minnesota, as well as on deforested land in northern Minnesota.

[1725]. 21.0 (82) : 12.26–8 : 23.23 : 12.11.22. Jorge Dimitri, M., and Rial Alberti, F. Las especies del género '*Tilia*' cultivadas en la Argentina. **[Species of *Tilia* cultivated in Argentina.]** *Revista de Investigaciones Agrícolas, Buenos Aires* 2 (1), 1948 (1–36). 34 refs. [Span.span.e.] P.R.

The species of *Tilia* cultivated (mainly for ornamental purposes) in Argentina are described, and notes are included on their silvicultural characteristics, propagation and utilization. The species which best supports a hot climate is *T. tomentosa*, while × *T. moltkei* thrives in warm and humid conditions, and has been found as far north as Jujuy. *T. platyphyllos* is not amenable to a warm, dry climate and thrives better in the Andean-Patagonian regions than in Buenos Aires. Species recommended for a climate similar to that of Buenos Aires, or preferably a moister and cooler one, are, in order of importance, × *T. moltkei*, *T. tomentosa*, *T. petiolaris*, *T. dasystyla*, × *T. euchlora*, *T. neglecta*, *T. caroliniana*, × *T. europaea* and *T. cordata*. The trees are propagated from cuttings, suckers, seeds or by grafting. Certain species, e.g. *T. petiolaris*, *T. caroliniana* var. *rhoophila*, × *T. euchlora* and × *T. moltkei*, have never been known to bear fertile fruit in Argentina and are therefore propagated vegetatively. × *T. moltkei*, the species best adapted to the climate, fortunately produces an abundance of suckers. Those chosen for propagation are partially covered with earth, so that a larger number of roots develop, and in the rainy season of the following year the suckers are removed and planted in the nursery. Other species may be grown from seed, but success is not always obtained, since many sterile fruits are produced and germination is slow and difficult. Mature fruits should be stratified for 20 months before sowing. If, however, they are gathered before maturity, they will germinate much more rapidly, usually in the following spring.

[1726]. 21.0 (86) : 12.26–8 : 12.11.3. Lindsay, W. R. **Growing Teak in the Canal**

zone. *Foreign Agric.* 12 (9), 1948 (197–8). [Canal Zone Experiment Gardens, Summit, C.Z.] E.M.B.

A brief report on experiments in cultivating Teak [*Tectona grandis*] in the Panama Canal Zone, where good growth has been obtained. The tree needs a sandy or clayey loam of good depth and drainage, for it produces a large and deep root system. For rapid germination seeds need to be soaked in water for 24 hours, before planting in nursery beds at intervals of 3–6 in., and covering with soil to a depth of not more than 0·5 in. The beds need plenty of light. A light mulch helps to maintain the desirable high moisture content of the soil. Germination takes place in about 3 weeks, and, in favourable conditions, a height of 4–10 ft. is reached in the first year. Plantations can be established by direct sowing, but it is cheaper and better to plant 1-year-old nursery seedlings with a stem at least $\frac{1}{2}$ in. thick at 6 × 6 ft. spacing. When planting, the stem should be cut back to within an inch or so of the collar, and the roots may be trimmed to 8 or 9 in. Burning over the area before planting has a most beneficial effect, and the author suggests that Teak plantations could well be combined with shifting cultivation. Plantations must be kept clear of weeds On good soil, thinnings need to be made after 5 years, when about half the stock should be removed. Subsequent thinnings are carried out on a 5-year cycle. Few diseases and pests have occurred. Some damage is done by parasol ants (*Atta* spp.), but the nests are easily destroyed with either Chlorane or CS_2. Burmese stock has been found superior to Indian, both in form and height growth.

[1727]. 21.0 (88). GONGGRYP, J. W. Quelques remarques sur l'emploi d'essences exotiques et indigènes dans la sylviculture tropicale. **[Notes on the use of exotic and indigenous species in tropical forestry.]** *Bois For. Trop.* 7 (3), 1948 (251–7). [F.]

The author takes advantage of a visit to Surinam, where he inspected the remains of experiments in planting and regenerating which he had superintended from 1910 to 1923. The attempt to establish *Hevea* plantations had failed completely owing to the prevalence of the leaf disease, *Melanopsammopsis* (*Dothidella*) *ulei*. Other disappointing species were *Cedrela odorata* and *Swietenia mahagoni*, both of which suffered severely from the twig borer, *Hypsipyla grandella*, and were then suppressed by the regeneration of other species. An indigenous species of Meliaceae, *Carapa procera*, on the other hand, gave good results, although it too was sometimes attacked by the same insect.

In general, the remains of these old attempts at regeneration indicate that success is assured with those species which in nature form fairly pure stands, e.g. *Goupia glabra*, *Mora excelsa*, *Manilkara bidentata*, *Eperua falcata*, *Vouacapoua americana* and *Dicorynia paraensis*. *G. glabra* in particular easily produces vigorous regeneration, amongst which *D. paraensis* later naturally introduces itself. Amongst exotic species which regenerated satisfactorily were *Hymenaea courbaril*, *Loxopterygium sagotii*, *Dipteryx odorata*, *Bertholletia excelsa*, *Caryocar nuciferum* and *Platonia insignis*.

21.3. *Soil Requirements*

See also *For. Abstr.* 10 (Nos. 1580, 1583).

[1728]. 21.3 : 12.14.3 : 12.11.13. VERHOEF, L. Wortelstudiën in de tropen. VI. Nadere gegevens omtrent de zuurstofbehoefte van het wortelstelsel. **[Root studies in the tropics. VI. Further data on the oxygen requirement of the root system.]** *Korte Meded. Boschbouwproefsta., Buitenzorg* No. 81, 1943. pp. 65. 21 refs. [Du.jav.e.]

Describes work, in continuation of Coster's studies (*Korte Meded. Boschbouwproefsta., Buitenzorg* No. 31, 1932), on 373 species of trees, shrubs and herbs. Some correlation was found to exist between taxonomic groups (families and genera) and O_2 requirement, though it is not possible on the basis of this to predict the O_2 requirement of individual members of such groups. In general, results for any given species were fairly consistent. Species of the plains tended to have a higher tolerance of O_2 deficiency than those of the mountains. Points worthy of special attention are: (1) Godavari Teak was much more resistant to O_2 deficiency than other races of *Tectona grandis*. (2) *Altingia excelsa* showed wide variation in O_2 requirements and is suspected on other grounds of representing several races or varieties. (3) *Schima noronhae* and *S. bancana*, sometimes regarded as conspecific, differed in their O_2 requirements.

(4) Species which, owing to high resistance to O_2 deficiency, may be worth growing on swampy or heavy soils, are:—*Acacia arabica*, *Cassia grandis*, *Carapa guianensis*, *Khaya senegalensis*, *Filicium decipiens*, *Eugenia lineata*, *Casuarina junghuhniana*, *Zizyphus celtidifolia*, and to a lesser degree—*Acacia auriculiformis*, *Inga laurina*, *Peltophorum pterocarpum*, *Anacardium occidentale*, *Zizyphus jujuba*, *Manilkara kauki*, *Mimusops elengi*, *Eugenia cumini*, *Casuarina equisetifolia* and *Anthocephalus macrophylla*. (5) Of green-manure and cover species, etc., the following have a fairly high resistance against O_2 deficiency:—*Sesbania sesban*, *Indigofera galegoides*, *Aeschynomene americana*, *Leucaena pulverulenta*, *Acacia villosa* and *Thespesia lampas*.

[1729]. 21.3 : 12.25 (437) : 42.5 : 11.47 : 12.11.11. Němec, A. Biochemicko-pedologické studie o příčinách krnění smrku a borovice v polesí Smrček státní lesní správy Slatiňany u Chrudimi. **[Biochemical and pedological studies on the causes of checking of Norway Spruce and Scots Pine in the Smrček circle, State Forest of Slatiňany, near Chrudim.]** *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (31–52). 10 refs. [Cz.e.russ.] [Ustav lesní biochemie a pedologie, Prague.]

Checked growth of Scots Pine and Norway Spruce plantations in this area occurs on soils of various geological origin and is attributed to changes brought about by litter removal, clear felling and planting pure conifers, which have led to mor formation, strong acidification of the upper soil horizons and consequently leaching, particularly of CaO.

Pure Spruce is entirely unsuitable for any of the sites in question. Needle analyses showed a disturbed nutritional balance (decreased CaO and N contents; increased K_2O, MgO, SiO_2, Mn_3O_4 and SO_3). The Scots Pine needles had also low CaO and N contents, with abnormally high K_2O and MgO.

Rates of liming are indicated for the various soils, some of which will also need K and P fertilizers. Waste from local quarries working basic eruptive rocks such as basalt and diabase, is suggested as a suitable fertilizer.

[1730]. 21.3 : 12.25 : 11.47.13 : 23.26.4. Němec, A. Význam mikroelementů pro vzrůst lesních dřevin. **[The importance of minor elements for the growth of forest trees.]** *Lesn. Práce* 27 (4/5), 1948 (117–30). 24 refs. [Cz.e.] [Ústav lesní biochemie a pedologie, Prague.

Reviews literature, with special reference to Mn, Cu and B, and briefly describes experiments in Czechoslovakia with the two latter.

(1) In 1934, in a checked Norway Spruce plantation on a degraded sandy podzol with hardpan, the heather was removed, the soil loosened and copper slag (1·62% CuO) applied at 12 kg./100 sq.m. In 1946 the heights of the treated and untreated plots were respectively 116·8 and 94·4 [cm.?], the foliage of the former being green and that of the latter yellow-green.

(2) In 1940, a deep, clayey, somewhat acid nursery soil (pH 5·92), poor in N, P and K, was treated with ground limestone alone (2 kg./5 sq.m.) or the same plus borax (25 g. borax, or 2·87 g. B/5 sq.m.). Norway Spruce 1/0 stock was put in 14 days later. Both treatments improved development and foliage colour of the transplants, the combined Ca/B treatment giving the better results. This was confirmed by the fresh weights of the transplants in mid-April 1943. For controls, Ca- and Ca/B-treated plots (in that order and in decagrams per 100 plants) these were:—shoots—240, 232, 287; roots—87, 99, 172; total—327, 331, 459.

21.6. *Behaviour in the Stand. Growth Form. Habit*

See *For. Abstr.* 10 (Nos. 2272, 2327).

21.8. *Phenology*

See also *For. Abstr.* 10 (Nos. 1593, 1742, 1752, 1765–6, 1796–7, 1902, 2273, 2279).

[1731]. 21.8 (675). Capon, M. Observations sur la phénologie des essences de la forêt de Yangambi. **[Observations on the phenology of Yangambi forest species.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (849–62). [F.]

Phenological observations have been made since 1937 on some 600 species of trees and climbers in the rain forest of Yangambi. About half of these display a vegetative cycle corresponding to one or other of Martineau's overlapping periods (one from February to November, the other from mid-August to March). Some species, e.g. *Entandrophragma*

angolense and *E. utile*, seem to follow both periods. *Autranella congolensis* appears to have a cycle of 18 months. *Khaya anthotheca* appears to have an intermediate period between the two. Other species have a single vegetative period, but so long that it includes and exceeds both the Martineau periods. Individual trees sometimes appear to have their peculiar cycles, particularly when growing in an uncongenial environment or at the limit of their range.

[1732]. 21.8 (82). La brotación y floración de las plantas y el tiempo en la ciudad de Buenos Aires durante el segundo semestre del año 1947. [**The flushing and flowering of plants and the weather in Buenos Aires city during the second half of 1947.**] *Bol. fenol. Dep. Met. agric., Argent.* No. 1, 1948 [8–9]. [Span.]

Since 1938, records of dates of flushing and flowering have been kept for a number of native and exotic plants (including tree species) growing in Buenos Aires. The average dates and the dates noted in the second half of 1947 are presented in graphical form, along with curves for temperature, rainfall, hours of sun and relative humidity in the same period.

[1733]. 21.8 : 12.26–8 : 34.27. [**Phenology of *Shorea* spp.**] *Rep. For. Dep. Sarawak 1947*, 1948 (8).

Although there are some 12 species of *Shorea* from which Illipe nut or *engkabang* is harvested, the bulk of the crop is obtained from *Shorea gysbertiana* and *S. martiniana*. Fruiting is irregular, following a cycle of approximately 4 years. An extra dry spell in July or August is usually associated with a flowering in September, but a heavy flowering by no means guarantees a heavy crop. Storms of wind and rain, when the fruit is setting, may cause considerable damage. The crop ripens and is collected between December and March.

[1734]. 21.8 : 12.29 : 23.1. [**Flowering of Bamboo.**] *Rep. For. Dep. Nyasald. 1946*, [?1948] (7).

Flowering and seeding of the common Bamboo, *Oxytenanthera abyssinica*, continued in the Mua-Livulezi Forest for the fourth year in succession, but by the end of the year it became apparent that flowering was over, and nearly all of the clumps were dead. It was observed that no flowering had taken place in the dense thickets along stream banks, but only on the poorer, drier soils away from streams. Natural regeneration appears to be satisfactory, although much seed is eaten by baboons while still on the culms, and by rodents after falling to the ground.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

See also *For. Abstr.* 10 (Nos. 1716, 1745).

[1735]. 22.14.2 : 12.25 (774). ROBBINS, P. W. **Wood production on the Dunbar Forest Experiment Station.** *Quart. Bull. Mich. agric. Exp. Sta.* 31 (1), 1948 (57–60).

Analysis of records of cutting operations from 1926–47 leads to the conclusion that selective cutting is adaptable to the Spruce/Balsam Fir type, provided that a sufficient volume of growing stock of desirable pulpwood species is left. It offers protection from windthrow if the degree of cutting is not over 50–60%, and especially if the White Pine in the stand is retained for sawlogs in the second cut. Clear-cut areas of pulpwood types will produce a second crop in 28–30 years, provided they have adequate reproduction on the ground or establish it immediately after logging, and receive improvement cuttings during the rotation.

[1736]. 22.14.2 : 12.25 : 23.1. PHELPS, V. H. **White Spruce stands cut to different diameter limits in Northern Saskatchewan. Project MS–19.** *Silv. Res. Note For. Serv. Can.* No. 85, 1948. pp. 20 + 8 photos, 10 tbls.

Report on a survey of cut-over White Spruce stands in the Pasquia Forest to determine which of the following kinds of cutting is silviculturally preferable:—(1) cutting to a 12-in. minimum diameter limit on an 18-in.-high stump; (2) cutting to a 14-in. minimum diameter limit on a 12-in.-high stump. The comparison was based on volume of sawtimber removed, frequency of stems by diameter classes in the residual stand, prevalence of windthrow, injuries to stands due to logging, quality of trees left, amount of ground shade provided by crown cover of the residual stand. These data are set out in a number of tables. It is recommended, as a result of the investigation, that system (2) should be

adhered to as a general policy, but that each stand should be examined before logging and any necessary changes made in the diameter limit, and that immature stands growing at a good rate should not be cut. If for economic reasons the latter have to be cut, the minimum diameter should be at least 16 in. [Cf. *For. Abstr.* 10 (No. 1746).]

[1737]. 22.15 : 12.26–8 (595). **Two-storey Mangrove forest.** *Malay. Forester* 11 (4), 1948 (173).

A 10-acre plot in the Matang Mangroves has shown that two-storeyed forest with a felling every 20 years is impracticable owing to the damage done to the understorey by the felling of the overwood.

22.8. *Silvicultural Description of Forms of Stand*

See also *For. Abstr.* 10 (No. 1571).

[1738]. 22.8 : 12.26–8 (493) : 23.2. DELEVOY, G. Essais sur des modes de boisement en essences feuillues aux champs d'expérience de Belle Étoile (Forêt de Soignes). **[Experiments in methods of afforestation with broadleaved species in the Belle Etoile experimental plots in the Forest of Soignes.]** *Bull. Soc. for. Belg.* 55 (10), 1948 (387–408). [F.]

Report on an inspection made in 1937 of plantations formed from 1906 onwards. The information in the tables gives mean height, diameter and volume, and mean annual increment in volume for the following types of plantation [figures in brackets denote m.a.i. in cu.m./ha.]:—pure stands of Oak (4·3), Ash (1·9), Norway Maple (3·2), Sycamore Maple (4·7); mixtures of Norway and Sycamore Maple (4·1), Oak and Sycamore Maple (4·2), Oak and Norway Maple (3·6), Oak and Ash (3·8), Ash and Sycamore Maple (3·0), Ash and Norway Maple (2·3), Beech with Alder nurse crop (5·4), Beech without shelter (5).

[1739]. 22.8 : 12.26–8 (775) : 56.02. SCHOLZ, H. F. **Diameter-growth studies of Northern Red Oak and their possible silvicultural implications.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (421–9). 8 refs.

Studies were made of 4 stands of *Quercus borealis* in south-western Wisconsin, the general object being to compare diameter-growth rate for this species grown: (1) as single stems or small groups in mixture with more shade-tolerant hardwoods, (2) as pure, or nearly pure, stands of seedling or seedling/sprout origin, and (3) as pure, or nearly pure, stands of coppice origin. The following tentative conclusions were reached: (*a*) *Q. borealis* can recover successfully from prolonged crowding and subsequently make good diameter growth in competition with such shade-tolerant species as Sugar Maple, American Basswood, and Slippery Elm. It seems probable that this species may have a higher degree of shade tolerance than is commonly supposed. (*b*) There is evidence that *Q. borealis* asserts and maintains its dominance in mixed Oak stands from an early age. (*c*) Clear cuttings which result in large blocks of even-aged coppice may be silviculturally undesirable for the mixed Oak forest type. Growth measurements carried out for 15 years in such a stand show that the early vigour of the sprout reproduction has declined by about 50%, as measured by annual diameter increment, between the stand ages of 40 and 55 years.

[1740]. 22.83 : 12.26–8 : 12.25 (485). NORBÄCK, G. Blandbestånd av ek och gran. **[Mixed stands of Oak and Norway Spruce.]** *Svenska SkogsvFören. Tidskr.* 46 (1), 1948 (19–24). [Sw.]

Contests, with evidence from Hornsö Crown Park, the opinion that Norway Spruce should not be used in mixture with Oak. At Hornsö the 2 species thrive together on the best sites and the Oak keeps pace with the Spruce, though there is a danger of its forming whippy stems if kept too dense. The Spruce is due for gradual removal, leaving Oak as the final crop. In spring, 1947, when pure Oak suffered from both frost and attack by caterpillars, that in mixture was affected by neither. It is also less likely to suffer from elk damage, in view of the elk's tendency to avoid Spruce stands. In 1947 the author interplanted Oak 4 m. apart in Norway Spruce on good sites. If these develop well they will produce four times the area under Oak that would have resulted from a pure plantation with the same number of plants. The aim with such mixtures should be to have enough Oak for the Spruce to be felled out at about 40 years. At planting time the Oak should be a few years older than the Spruce.

23. FORMATION OF STANDS

[1741]. 23 (931) : 21. SMITH, C. M. **Planned regeneration of N.Z. indigenous forests.** *Aust. Timb. J.* 14 (6), 1948 (365–6, 368, 373, 375). [New Zealand State Forest Service.]

Gives reasons for the regression of indigenous forests in New Zealand and discusses natural regeneration of certain native species. A table sets out the growth and cultural characteristics of 16 New Zealand trees, their coppicing ability, flowering characteristics, frequency of seed years, seed collection, storage and germinative capacity, growth of the tree and its social habits. The same 16 species are also classified according to their value, (*a*) to the timber merchant, and (*b*) to the forester. Although Kauri [*Agathis australis*] is preferred by the timber merchant, Silver Beech [*Nothofagus menziesii*] and Red Beech [*N. fusca*] are of greater value for afforestation, since the seed germinates readily and the tree can grow on land not suitable for agriculture.

[1742]. 23 (931) : 12.26–8 : 23.23.1 : 21.8 : 22.88.1. POOLE, A. L. **Recent researches on southern Beech.** *Aust. Timb. J.* 14 (6), 1948 (377, 379, 381, 383, 385, 387). 5 refs.

Discusses some problems of the regeneration and management of the New Zealand Beech (*Nothofagus* spp.) forests, the least exploited of the country's primitive forests, partly because of their general inaccessibility and partly because their soils are not suitable for present agricultural requirements. The characteristics of various species are briefly discussed. As with European Beech, good regeneration can be obtained in good seed years, where light is sufficient, but little is known about the periodicity of 'mast' years in New Zealand *Nothofagus*. The disposal of over-mature trees in the virgin forests, and the selection of types for regeneration are further problems to be solved. [Cf. *For. Abstr.* 8 (No. 993).]

[1743]. 23 : 12.25 (485) : 44.1 : 41 : 12.19.23. ARNBORG, T. Föryngringsundersökningar i mellersta Norrland. **[Regeneration experiments in central Norrland.]** *Norrlands SkogsvFörb. Tidskr.* 1947 (2), (247–93). 5 refs. [Sw.sw.]

Deals with studies of natural regeneration and direct sowings of Norway Spruce and Scots Pine on the Mo and Domsjö Company's lands in 1943–6.

After the good seed year of 1942–3 there were abundant Spruce seedlings (up to 9,000 per are under close canopy) in summer 1943, but by autumn their numbers were already much reduced and after 4 years only about 10% survived. In the forest type concerned (fresh *Vaccinium* type) natural seedlings grew extremely slowly, the total height at 4 years of age being more often under than over 6 cm. In a gap of 3–4 ares in 125-year-old Spruce of the same type there remained only 90 plants per are after 4 years. An open plot of about 600 sq.m. was treated in early October, 1942, with 90 kg./ha. of $KClO_3$ in powder form: on this, natural regeneration was a failure, and the treatment only temporarily weakened *Vaccinium myrtillus* but greatly encouraged *Deschampsia flexuosa*, which became dominant, while reducing the *Pleurozium schreberi* layer.

Direct sowings of Scots Pine and Norway Spruce made on moss or lichen in undisturbed ground vegetation were practically complete failures. Similar sowings in which seed was pushed into the bottom litter were little better. In sowings on prepared patches (ground cover removed), covering the seed gave much the best results. Where a thin layer of humus was left, results were poorer than where sowings were made in the (unloosened) mineral soil. Sowings on July 1 gave the greatest number of plants; seed sown on September 1 germinated only in the next year and gave few seedlings.

In the first year after sowing, about equal numbers of Pine and Spruce seedlings were obtained: in the second, the proportions had changed to give more Spruce on the moister and more Pine on the drier sites.

A comparison of Spruce seedlings in natural regeneration on an untouched plot, subject to root competition from old trees, with those on an adjacent plot isolated from root competition, showed that in the first 4 years the seedlings freed from root competition grew about 4 times as fast as the controls.

Temperature and precipitation records are presented for a number of stations, and the length and incidence of the summer warm period is indicated in a new way by graphs showing the periods for which air temperatures exceed 10° and 13° C. The limiting factor for success of regeneration is not a temperature adequate for germination, but rainfall: drought

is the greatest cause of seedling mortality. Covering the seed with gravel, sawdust, etc. is generally too expensive, but equally good results can be obtained (except where frost-heaving is severe) by sowing in a furrow 1–2 cm. deep and covering the seed with material from the exposed surface of the prepared patch.

[1744]. 23 : 12.25. **[Comparison of growth of artificial reproduction of Douglas Fir with natural seedlings.]** *Rep. B.C. For. Serv. 1947*, 1948 (21 + 1 gph).

Available measurements from all experimental plots were assembled to obtain average values of initial height growth for Douglas Fir reproduction and also to compare growth of artificial reproduction with natural seedlings. Height growth of reproduction up to 10 years on poor sites was only 30–40% of that on good sites. In the field, the appearance of sites carrying mixed types under 15 years old seemed to indicate that natural reproduction lagged behind artificially sown reproduction, in height growth, but analysis of the data showed that there was no difference in the height of trees of the same age when both types were on the same site. Difference in height of the 2 types was due to earlier re-establishment of a stand by artificial sowing than by natural reproduction.

23.1. *Natural Regeneration*

See also *For. Abstr.* 10 (Nos. 1658, 1734, 1762, 2256).

[1745]. 23.1 : 12.25 (498) : 22.12 : 24.3. MAGDAS, V. Momente importante in regenerarea naturală a bradalui. **[Important points in the natural regeneration of Fir.]** *Rev. Pădurilor* 63 (3), 1948 (92–5). [Rum.f.]

Abies alba is abundant in the northern foothills of Moldavia, growing both pure and in mixture with Beech. It is found on all aspects down to a level of about 350 m. The existing stands are, however, often poor, and the author describes methods of carrying out regeneration fellings to secure satisfactory natural regeneration, and improvement cuttings for improving the quality of existing stands and increasing the proportion of Fir in mixed stands.

[1746]. 23.1 : 12.25 (712.1). PHELPS, V. H. **White Spruce reproduction in Manitoba and Saskatchewan. Project MS–16.** *Silv. Res. Note, For. Serv. Can.* No. 86, 1948. pp. 32. 3 refs.

The existing White Spruce (*Picea glauca*) seedlings in Manitoba and Saskatchewan are insufficient to provide for properly stocked future stands. Many seedlings become established, but the majority fail to survive more than 2 or 3 years. Some of the factors influencing establishment and survival have been investigated. Data have been collected on about 3,000 plots, and these are analysed for the purpose of determining if any correlation exists between the factors studied and the amount of reproduction. The investigation indicates that new stands will not be forthcoming from natural seeding on the cut-over or burned-over areas. Further study will be undertaken to determine the possibility of assisting nature by silvicultural treatment. *From author's abstract.* [Cf. *For. Abstr.* 10 (No. 1736).]

[1747]. 23.1 : 12.25 (761) : 11.47.21. MORRIS, D. J., and MILLS, H. O. **The Conecuh Longleaf Pine seedbed burn.** *J. For.* 46 (9), 1948 (646–52).

Advantage was taken of an exceptionally good seed crop in the Conecuh National Forest, Alabama, to experiment with summer and autumn burning to provide a suitable seedbed on cut-over Longleaf Pine forest with seed trees. Burning was done on 26,000 acres between the beginning of August and the end of October when seedfall began. An initial catch of 1,000 or more seedlings per acre was obtained on 93% of the area at a cost about 1% of that of planting. The average per acre was 13,200, with 4,000 or more on 73% of the area. The proper distribution of seed trees is important. The value of burning increased as the amount of available seed decreased. Further experiments are to be made.

[1748]. 23.1 : 12.25 : 47 : 43.11 : 32.29.2. WEAVER, H. **Management problems in the Ponderosa Pine region.** *Northw. Sci.* 21 (4), 1947 (160–3). 4 refs. A.P.B.

Causes of overstocking and stagnation, insufficient natural regeneration, changes of population, insect attack and fire hazard in the Ponderosa Pine region are discussed, and experiments in prescribed burning on the Colville Reservation in Washington are described [cf. *For. Abstr.* 8 (No. 329); 9 (No. 1260)]. Up to the present, slash from the cutting of approximately 200 million bd. ft. of timber has been

disposed of on 39,000 acres of cut-over land, and fire hazard in this area has been satisfactorily reduced. Natural regeneration is progressing well, as is illustrated by data from a cruise of 144 $\frac{1}{250}$-acre quadrats on the Granite Lake prescribed burn of 1942. Immediately after the burn 48 quadrats, and 5 years after, 98 quadrats, were fully stocked.

[1749]. 23.1 : 12.25 (942) : 23.23.11 : 12.11.21. FIELDING, J. M. **The seeding and natural regeneration of Monterey Pine in South Australia.** *Bull. For. Timb. Bur. Aust.* No. 29, 1947. pp. 60. 8 refs.

The paper describes investigations carried out in the south-east of South Australia on the production and dissemination of seed by *Pinus radiata*, and the application of different systems for the natural regeneration of this species. The development of the male and female cones, pollen shed, and course of maturation of the seed are described in detail. Viable seed is produced from the age of 6 years. At Mount Burr the seed becomes fully mature 2 years after the appearance of the female flowers. There is great variation in the production of seed from year to year, and the amount of seed produced by unthinned plantations declines rapidly after the age of about 18 years, this decline being particularly marked on very high quality sites. From observation of trees over 30 years old on a seed-tree area, it appears likely that this decline might be checked by heavy thinning.

The dissemination of the seed, the large variations in the amount and time of dissemination, and the distance to which seed is disseminated from a forest margin are discussed. Practically the entire seedfall occurs each year during, and on the days immediately following a few well defined, hot, dry periods, which together represent only a very small part of the summer season. The direction and distance of dissemination are dependent upon the direction and strength of the wind; the number of seeds reaching the ground at a distance of $\frac{1}{2}$ a chain (33 ft.) is relatively small and decreases considerably between $\frac{1}{2}$ and 2 chains. Investigations into the numbers of seeds in the litter throughout the year, showed that the bulk of the seeds germinated during autumn and winter, and that by the end of the spring only a few ungerminated, viable seeds remained. The period of germination is shortest in spring and autumn.

The influence of various factors which cause seedling losses in regeneration areas is described. Rabbits can cause severe losses, and the density of regeneration is much reduced on areas covered by heavy slash.

The relative advantages and disadvantages of the natural and artificial regeneration of *P. radiata* are listed. Experiments carried out over a period of 3 years on the system of clear felling with natural regeneration are described. The season of felling is a factor of particular importance; density of regeneration shows a general annual trend from a maximum on areas felled at the end of one season of seedfall to a minimum on areas felled just before the commencement of the next.

[1750]. 23.1 : 12.25 : 23.23. BRAMBLE, W. C. **Effect of seedbed type and protection upon germination and early establishment of Virginia Pine.** *Res. Pap. Pa. St. For. Sch.* No. 9, 1947. pp. 5. 3 refs.

Tests were made on 3 types of seedbed, (1) under an old Pine stand, (2) on abandoned pasture, (3) on old fields, each being given 5 different treatments, and all treatments were duplicated (with or without protection against rodents, etc.). It was found that exposure of the mineral soil was necessary on type (1), and increased germination and survival on (2) and (3). Covering of seed with mineral soil was necessary on (1) whether protected or not, and on (3) if unprotected. Protection increased germination and survival on (2) and was necessary for adequate survival on (3).

[1751]. 23.1 : 12.25 (759) : 22.82.2. VERNON, R. O. **Cypress domes.** *Science* 105 (2717), 1947 (97–9). 5 refs. [Florida Geological Survey, Tallahassee.] O.R.S.

A unique feature of the Florida peninsular flat lands are stands of Cypress (*Taxodium distichum* and *T. ascendens*) growing in dome-like masses with taller trees towards the centre and successively shorter and younger ones towards the periphery. It is known that *Taxodium* seed will not germinate when covered with water. On the other hand, whereas young Cypress trees or seedlings will die if suddenly submerged in water, growing trees and saplings are able to adjust themselves to a gradual submergence. The author suggests that the domes were begun in seasonal ponds or swamps, the seeds germinating when not submerged and growing sufficiently high to

stay above seasonal rises in water level. A gradual deepening and widening of the pond may then have occurred, and new growth being unable to take place in the centre, regeneration has been confined to the progressively widening shore.

[1752]. 23.1 : 12.26–8 : 21.8 : 42.22. **Natural regeneration of *Anogeissus latifolia*.** *Indian For.* 74 (1), 1948 (10).

Evidence from Gwalior indicates that this species, which is notorious for the infertility of its seed, produces abundant fertile seed after a year or years of drought. In the Sheopur district, where the normal annual rainfall is 33 in., the mean annual rainfall over the years 1938–42 was not much more than half that amount, and by 1941 there were signs of die-back of *Anogeissus*. At the present time there is profuse regeneration 2–6 ft. high under dead or dying trees. It is recommended that seed should be collected in years of drought and succeeding years and tried in areas deficient in natural regeneration.

23.2. *Artificial Regeneration*

[1753]. 23.2 (729.5) : 21 : 23.6 : 12.19.2–3. MARRERO, J. **Forest planting in the Caribbean National Forest—past experience as a guide for the future.** *Carib. For.* 9 (2), 1948 (85–213). 14 refs. [E.Span.e.span.]

The vegetation types in the Caribbean National Forest include the lower montane rain forest, montane rain forest and elfin woodland and contain a great many species. Large-scale forest planting began in 1936 and from then till 1945, over 7 million seedlings were planted out and about 64,000 lb. of seed sown over 4,000 acres. Survival was generally low and the cost of establishment and maintenance was high because of heavy replanting and the need of a long period of weeding and vine-cutting. Analysis of these drawbacks indicates that they were largely due to lack of research before planting began. Detailed notes are given on the silvicultural characters of the 38 species used. Among the recommendations for the future are the following:—

(1) Weeding in unshaded plantations should stop when the planted trees are some 2 ft. taller than the surrounding vegetation. This generally takes no more than 2 years in the open and weeding may not be necessary at all in the shade. Two to 4 weedings are needed a year according to the luxuriance of weed growth. Weeding should never disturb the soil; grass and herbs should be cut to a height of 1–2 in.

(2) Vine-cutting is needed in unshaded plantations until a closed canopy is formed. This may take 5 or more years.

(3) Pruning does not seem necessary; dead branches are rapidly eliminated by termites, and branching is more effectively controlled by closer spacing.

(4) Shaded plantations should be liberated before the planted trees are deformed or their growth checked. Overstorey trees should generally be cut rather than girdled.

(5) Field planting in the open should be done at a close spacing of 5–8 ft. each way. Under a canopy a wider and more irregular spacing of 10–25 ft. should be used. Wherever available, wilding stock should be used.

[1754]. 23.2 : 07.7 : 11.47.13. GAUCHOU, M. En visitant le xx^{e} salon de la machine agricole. **[A visit to the 20th exhibition of agricultural machinery.]** *Agron. trop.* 3 (7/8), 1948 (411–8). [F.]

Notes on various types of tractor, mechanical plough, disker, planting machine, drier etc. Among the new machines was the Autopal, developed by the Omnipal Co. of Aubervilliers, a tractor-drawn implement for injecting disinfectants or soluble fertilizers into the soil.

[1755]. 23.2 : 12.26–8 (410). **[Oak planting experiments.]** *Rep. For. Comm., Lond. 1947*, 1948 (38).

A detailed assessment of a large series of Oak planting experiments at Dymock Forest (laid out 1927–30) showed that initial differences in treatment such as the use of different types of planting stock, weeding, hoeing, manuring, grading of nursery plants, direct sowing with varying numbers of acorns per patch, the use of different spacings and the planting of seedlings singly or in bunches, all produced satisfactory plantations; early differences in growth, where present, had practically disappeared.

23.22. Preparatory Work. Auxiliary Measures

See also *For. Abstr.* 10 (No. 2241).

[1756]. 23.22 : 11.48.3 (774) : 23.24.2 : 23.21 : 24.4. DAY, M. W., and NELSON, T. C.

Tree planting on clay soils. *Quart. Bull. Mich. agric. Exp. Sta.* 31 (1), 1948 (28–34). 4 refs.

This experiment was made on a field of Ontonagan clay which had been under grass sod for 10 years, and had a high water-table (4 in.–2 ft. below ground surface in June). Lack of aeration in the soil and severe competition from grass were the principle obstacles to establishing tree plantations. Various combinations of ridge ploughing and disking were tested. Best results were obtained by ridge ploughing in the autumn, followed by one disking in the spring when soil moisture was such that puddling of the soil would not occur. Planting was by the deep-hole method, using a spade. Data are given on the survival and growth of various species. For windbreak plantings, where rate of growth and growth habit must be considered as well as survival, it seems that *Pinus banksiana, P. sylvestris, Picea glauca* and *P. mariana* are best adapted to these soils in N. Michigan.

[1757]. 23.22 : 76.1 (410) : 23.24 : 23.61. James, N. D. G. **Cost reduction.** *J. Land Agents' Soc.* 47 (9), 1948 (234–6).

The author considers means of reducing planting costs in Great Britain, by mechanization and other methods. He gives some account of experiments in the use of pressure-operated burners for burning weeds, slash etc. *in situ* on the planting site, which was not very satisfactory, and the 'heather burner', which proved more efficient. Where hand cutting has to be done before burning, costs are high. The use of a motor-driven scythe or mower for cutting down weeds before planting and between rows in young plantations, is a promising method. Under good conditions (with no old stumps etc.) it has been possible to clear 2½ acres a day, compared with ¼–⅓ acre cut by hand, and costs have worked out at about 10*s.*/acre, including wages of the operator. Bulldozers are a valuable means of clearing derelict areas, especially slash left after a clear felling. Such sites may cost up to £35/acre to clear by hand. Recently an area of 4 acres of such land was cleared for £7/acre, using a hired bulldozer. The costs of hiring from contractors or an Agricultural Executive Committee is 20–30*s.* per hour according to the size of the machine. The reduction of planting costs by using wider spacing is noted. Assuming 90*s.* per 1,000 as the cost of plants, and a planting rate of 500 per man-day, where the weekly wage is £4 10*s.* per week, the comparative costs per acre at planting distances of 4½, 5, and 5½ ft. will be £13 7*s.*, £10 14*s.*, and £7 19*s.* respectively. Costs are also given for the use of bulldozers to make or re-make forest rides.

[1758]. 23.22.1 : 07.7 (485) : 76.1. Callin, G. Om markberedning med traktor. **[Soil wounding by tractor[-drawn cultivators, in preparation for direct sowings].]** *Norrlands SkogsvFörb. Tidskr.* 1947 (2), (175–90). [Sw.] (*Medd. SkogsforsknInst. Stockh.—Ser. Uppsatser* No. 5).

Describes rather larger-scale trials of Tirén's cultivator [see *For. Abstr.* 7 (No. 1728)] used with 3 types of caterpillar tractor—Caterpillar D2, Allis Chalmers HD–7W and Lanz-Bulldog D. 1561. Of these the first was only powerful enough to draw one cultivator-pair, the second drew two cultivator-pairs on slopes of up to 1 : 4 and the third was unsuitable. In these trials the rear cultivator of each pair weighed 180 kg. and was attached directly behind the fore cultivator, which weighed 200 kg. Where 2 or more pairs of cultivators are to be used in parallel, the spreader frame should be coupled to the tractor by chain, to give sufficient freedom of manoeuvre. If there is a dense growth of low shrubs, the claws of the cultivator will clog up, but provided the humus can be easily worked the partially clogged cultivators will still do their job. If possible, however, sites with dense growth should be burnt over, or at least snags should be removed, before cultivation. Tractor cultivation of this kind is not practicable on very stony sites or where many high stumps are hidden in shrub growth.

The Caterpillar D2, with one cultivator-pair, dealt with an average of 0·261 ha./hr., making 3,550 usable seed patches (of mean area 0·07 sq.m.) per ha. The Allis Chalmers, with two cultivator-pairs, did 0·54 ha./hr., making 2,800 usable patches (of mean area 0·19 sq.m.) per ha. Total costs per ha. (including amortization of equipment etc.) were respectively Kr. 50 and Kr. 39. Equivalent manual work would have cost Kr. 90–91 per ha. Such calculations do show that savings can be effected on sites suitable for tractor work, but must be taken with some reservations: choice of tractor, number of cultivators, etc., and consequently costs, will vary with site and cover. Much will

also depend on whether the tractor, when not required for this, is effectively used for other work.

[1759]. 23.22.1 : 07.7 (493). BODEUX, G. Que faut-il penser de la mécanisation dans les travaux forestiers en Campine Limbourgeoise? **[The mechanisation of forestry operations in the Campine of Limbourg.]** *Bull. Soc. for. Belg.* 55 (9), 1948 (321–35). [F.]

A study of comparative performance and cost of several types of tractor and plough for cultivating the hard, stony, podzolized soils of the Campine of Limbourg. The author is strongly in favour of Caterpillar tractors, and for these soils recommends a 45-h.p. rather than a 25-h.p. motor, despite the higher cost and greater consumption of oil. Comparison was also made of single- and double-shared ploughs; the first of which are recommended for use in soils with many hidden obstacles, and the second in good soils. Analysis shows that the comparative costs of ploughing with tractor and with horses were 530·31 fr./ha. and 2,000 fr./ha. respectively.

[1760]. 23.22.2 : 11.47.21 : 32.29.2 : 23.23.3 : 07.7. LUSTIG, E. Zwischenkultur im Forst zur Frage: Schlagbrennen—ja oder nein. **[Intercultivation in the forest as an alternative to slash burning.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (9/10), 1948 (65–8). [G.]

Condemns burning on grounds of the destruction of organic matter and useful organisms, the baring of the mineral soil to the weather, and the rapid loss of soluble nutrients in ash. Suggests that windrows of slash should be planted up, or better, sown with a variety of plants, from trees to herbs and climbers, which would create a favourable microclimate for the decay of the slash and provide browse for game, etc. Illustrates two tools devised by the author for sowing in tangles of brushwood: (1) a hoe with a pocket to hold seed; (2) a walking-stick sowing gun.

[1761]. 23.22.2 (436) : 34.2 : 12.26–8 : 76. LUSTIG, E. Aus der Praxis der forstlichen Zwischenkulturwirtschaft. **[Notes from practice on intercropping in the forest.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (17/18), 1948 (137–9). 3 refs. [G.]

Gives further notes on intercropping with oats and rye on clear-felled areas [cf. *For. Abstr.* 10 (Nos. 193–4, 734)], and points out that the wounding of the soil in preparation for the mixed sowing provides a good seedbed for natural regeneration of forest trees, especially Silver Fir, the seedlings also benefiting from the improved microclimate afforded by the grain crop. Wildings can also be transplanted to such sites with advantage if the seed supply is poor.

Since great numbers of Walnut (*Juglans regia*) trees in Central Europe have been killed by frost, there is an excellent market for young plants, especially of frost-resistant, high-yielding strains of vigorous growth, combining large kernels and thin shells. The Walnuts of Carinthia, especially of the district concerned, possess these qualities. It was therefore decided to experiment with felling areas as nurseries. A mixed sowing of oats and rye was made, Spruce was planted at 1·5 m. spacing in the autumn, a Walnut was sown midway between each two Spruce plants and the spot marked with a stick. In suitable places small densely sown beds were also made to give a reserve stock for filling any gaps. Good hardy plants are produced in 3–4 years' time. As the roots tend to spread in the forest humus, the plants are root-pruned, without lifting, a year before sale. The good market is likely to last for many years. Costs and returns are examined, with the conclusion that this form of intercropping yielded a rental about 3 times that of the forest crop proper. If there should later be a demand for clonal stock, it would be possible to raise and graft seedlings under cover in the nursery and to transplant them as graftlings to be grown on in the forest until ready for sale.

23.23. Seed and Sowings

See also *For. Abstr.* 10 (Nos. 1725, 1749–50, 1798).

[1762]. 23.23 : 65.7 : 23.1 : 01.7. ENEROTH, O. Om frömängden vid fläcksådd samt om sambandet mellan plantantal pr ha och slutenhetsgrad vid självsådd. **[On seed quantity in spot sowings, and on the relationship between number of plants per ha. and density of stocking in natural regeneration.]** *Norrlands SkogsvFörb. Tidskr.* 1945 (2), (161–222). 9 refs. [Sw.sw.]

Develops and tests against some field data a statistical formula which represents with good approximation the relation between totally

blank spots % and mean number of plants per spot in spot sowings. The same formula is further shown to represent the relation between number of seedlings per ha. and the proportion by area which shows a satisfactory stocking of seedlings, in natural regeneration. The only difference in the latter case is that the calculations are based on a sample quadrat of standard size instead of a sown spot. The formula is:—

$$\frac{P_o}{100} = \left(\frac{M}{s^2}\right)^{\frac{M^2}{s^2-M}} = \left(\frac{1}{t}\right)^{\frac{M}{t-1}} = \left(t\right)^{-\frac{M}{t-1}}$$

where P_o = number of blank spots; M = mean number of seedlings per spot; s = standard deviation of number of seedlings per spot; $t = \frac{s^2}{M}$. Some applications are shown by examples. The chief use envisaged is to facilitate objective expression of the density of seedling-stage forest.

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 10 (Nos. 1601, 1742, 2284, 2290).

[1763]. 23.23.1 : 07.2 (73). BARTON, L. V., and CROCKER, W. **Twenty years of seed research at Boyce Thompson Institute for Plant Research.** Faber & Faber Ltd., London. 1948. pp. 148 + 21 photos. Price 21*s*.

Covers the same ground as the relevant parts of a more comprehensive work published in America. [Cf. *For. Abstr.* 10 (No. 1592).]

[1764]. 23.23.1 : 12.25–9 (91). SOETARMO HARDJOWASONO, M. Gewicht en volume van verschillende vrucht- en zaadsoorten. [**Weight and volume of fruits and seed of various species.**] *Korte Meded. Boschbouwproefsta., Buitenzorg* No. 20 (rev.), 1942. pp. 172. 59 refs. [Du.jav.e.]

Tabulates, for 505 native and exotic woody species and varieties in the Netherlands East Indies, data on weight and volume of 1,000 seeds or fruits, number of seeds or fruits per kg., per litre and per 18½-litre kerosene tin, and (where known) times of flowering and fruiting in different parts of the region. An index arranged by vernacular names is also provided.

[1765]. 23.23.11 (471) : 21.8. HEIKINHEIMO, O. Frösättning och fröår. [**Seed setting and seed years.**] *Norrlands SkogsvFörb. Tidskr.* 1948 (1), (77–96). [Sw.]

Deals in general terms with:—flower-bud structure in Scots Pine, Norway Spruce and Birch in connexion with the forecasting of seed years; flowering and fertilization; seed maturation and quality, with maps illustrating the correlation of seed ripening and summer temperature in Finland; and seedfall records made by the Finnish Forest Research Institute since 1927 as a measure of the 'efficiency' of seed years. At Vilppula, the only station for which the 20-year record is complete, good Pine seed years were 1927, 1935, 1937, 1940 and 1941, with medium-good years in 1930, 1932 and 1946, while for Norway Spruce the good years were 1929, 1932, 1934, 1942 and 1946. The average seedfall per ha. per year was 0·75 kg. for Pine and 1·82 kg. for Spruce. The figure for the latter species would have been much higher but for insect, fungus and frost damage, and if seed plantations are to be established in the future, protection against such damage will be important.

[1766]. 23.23.11 : 12.25 : 21.8. [**Seed crops of *Pinus longifolia*.**] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (13).

Observations have been made over a period of 18 years on typical trees of about 24 in. d.b.h. The germinative capacity of the seed averaged 66·1%, with maximum 79·4% and minimum 46·6%. It showed remarkable correlation with class of seed year. Poor seed years gave poor and good seed years good germination. A proposed classification of seed years for this species is based on number of cones per tree as follows: (1) 376–500, (2) 251–375, (3) 126–250, (4) 61–125, (5) 1–60.

[1767]. 23.23.12 (410). JAMES, N. D. G. **Seed collection.** *J. Land Agents' Soc.* 47 (10), 1948 (245–6).

Notes on season and methods of collection and conditions of storage, in Great Britain, for seed of Ash, Beech, Oak, Chestnut, Larches, Scots Pine, Corsican Pine and Norway Spruce.

[1768]. 23.23.12 (494) : 12.11.3 : 23.26. FISCHER, F. La récolte des semences et son rôle actuel dans l'économie forestière. [**Seed collection and its present rôle in forestry.**] *Schweiz. Z. Forstw.* 99 (5), 1948 (231–41). [F.g.] [Institut fédéral de recherches forestières, Zürich.]

Reviews the problem of seed supply in Switzerland [cf. *For. Abstr.* 9 (No. 235)] from the point of view of the production of planting stock suited to the site. Suggests that for species and provenances whose seed is in short supply or which are difficult to raise, more rational production might be achieved by establishing a central nursery in each forest district, which would furnish small local nurseries with seedling stock.

[1769]. 23.23.15 (54). DENT, T. V. **Seed storage, with particular reference to the storage of seed of Indian forest plants.** *Indian For. Rec.* (*n.s.*) *Silviculture* 7 (1), 1948 (1–134). 44 refs.

Includes 62 pp. of tabulated data for various spp.

[1770]. 23.23.15 : 12.26–8 : 23.23.19. **[Germinative capacity of stored seed.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (14–5).

Data of germination % of the following species, stored 1–9 years (*a*) in tins, (*b*) in gunny bags:—*Acacia arabica, Acrocarpus fraxinifolius, Bombax malabaricum, Cryptostegia grandiflora, Dendrocalamus strictus, Leucaena glauca, Pterocarpus dalbergioides, Tephrosia vogelii.*

[1771]. 23.23.15 : 12.26–8 : 23.23.3 : 23.26. WEBSTER, C. C. **The effect of seed treatments, nursery technique and storage methods on the germination of Tung seed.** *E. Afr. agric. J.* 14 (1), 1948 (38–48). 8 refs.

[1772]. 23.23.15 : 12.25 : 45.12 : 13.2 : 23.23.3. **[Rodent-repellent treatment of tree seed.]** *Rep. B.C. For. Serv. 1947*, 1948 (23–4).

A preliminary field experiment was made with chemically treated Douglas Fir seed. An area logged and burned one year previously was selected for the study because the mouse population was high. The seed was divided into 2 lots—one stratified and the other not, but there were no differences in distribution, amount, and period of germination for the 2 lots. Part of each lot was enclosed with chemicals and peat in gelatine capsules, part soaked in a kerosene-creosote solution, and the remainder used for controls. Some spots were open, others protected by cages. On exposed spots, germination from the capsules was about equal to that of seed sown directly in the soil, but on protected spots it was better. Germination of creosoted seed was too low to determine the repellent value of this treatment, and the experiment was not varied enough to show the effect of treatment on germination. Mechanical protection of the seed was also attempted by spot sowing with the seed held between the prongs of wooden pegs. Results were encouraging and this method is promising for use in loamy soil.

[1773]. 23.23.19 : 12.25. **[Germination of *Juniperus macropoda* berries.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (14).

In an investigation with 1st-, 2nd-, and 3rd-year berries of *Juniperus macropoda* from Baluchistan, 1st-year berries produced no seedlings; 2nd- and 3rd-year berries showed a maximum germinative capacity of 0·8%.

[1774]. 23.23.19 : 12.25. PETROV, V. Vůrhu sroka za izpitvane kůlnjaemostta na bjal borovite, čer borovite i smůrčovite semena. **[The duration of germination tests for Scots Pine, Austrian Pine and Norway Spruce.]** *Gorsko Stopanstvo* 2 (1), 1946 (2–9). 9 refs. [Bulg.]

A plea for revised standards in germination tests of the 3 principal conifer species in Bulgaria. The rules of the Seed Control Service prescribe 21 days for determining the germinative capacity (G 21) of *Pinus sylvestris* and *Picea abies* and 42 days for *Pinus nigra*; while the germinative energy of all three is fixed at 7 days (G 7). Incidentally, the Central Institute for Forestry Research accepts 21 days as sufficient for *Pinus nigra* also. Such long periods for testing are inconvenient, and alternative rapid methods, like embryo colouring and seed cutting, are inapplicable owing to their many practical drawbacks. Now, the object of all tests is to afford an indication of the plant %, and both G 21 and G 7 are, with rare exceptions, higher under laboratory conditions than the plant % eventually raised in the nursery. The author presents a table for *Pinus nigra*, showing the course of daily germination for 28 batches of seed, and points out that for all batches with good germinative energy, the % difference between G 21 and G 7 is small, whereas with poor batches it is substantial; that the germinative

energy, according to many workers, bears a close relationship to the plant % and might be taken as a truer index of the latter; and that, nevertheless, the existing State rules do not take G 7 into account when fixing seed standards. The Seed Control Service is urged to adopt the 7-day germination test for these 3 conifers as the proper criterion of germinative capacity in the field and to take as their standard a G 7 of 50%, with 40% as the permissible minimum. Such a change would also economize testing time and space by two-thirds.

[1775]. 23.23.19 : 12.26–8. [***Poinciana regia* seed.**] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (14).

Seed of this species ran 88 to the ounce and germinated 11 days after sowing.

[1776]. 23.23.19 : 12.26–8. MARTIN, S. C. **Mesquite seeds remain viable after 44 years.** *Ecology* 29 (3), 1948 (393).

Five seeds of *Prosopis velutina* taken from a herbarium specimen collected in 1903 and deposited at the Southwestern Forest and Range Experiment Station, Tucson, Arizona, were placed between wet cloths. One germinated normally and 2 others germinated readily after having their impermeable coats nicked with a file. The practical implication of these results is that Mesquite seedlings may be expected to appear on cleared lands for many years after eradication of the original stand.

23.23.3. *Methods of Sowing*

See also *For. Abstr.* 10 (Nos. 1760, 1771–2).

[1777]. 23.23.3 : 12.25. **[Direct sowing of Hemlock and Cedar on snow.]** *Rep. B.C. For. Serv. 1947*, 1948 (23).

Direct sowing of *Tsuga heterophylla* and *Thuja plicata* was tested on a north slope in the Cowichan Lake district. Seed was mixed with sawdust and sown from a Cyclone seeder. Good distribution was obtained, but sawdust is not a fine enough carrier for use in this machine. It is not advisable to sow on steep slopes immediately before the thaw or when the snow surface is frozen hard. Sowing rate was one acre per man-hour.

23.24. Formation of Stands by Planting

See also *For. Abstr.* 10 (Nos. 1756–7, 1820, 1927).

23.24.1. *Planting Material*

See also *For. Abstr.* 10 (Nos. 1607, 1791).

[1778]. 23.24.1 : 12.25 (65) : 23.26 : 23.24.2. PUTOD, R. Les reboisements en pays méditerranéens par repiquages de jeunes semis. **[Afforestation in Mediterranean countries by planting out young seedlings.]** *Rev. Eaux For.* 87 (6; 7), 1948 (334–55; 402–23). [F.]

A detailed account of a method of planting developed in Algeria, where both direct sowing and the use of 1/0 planting stock are often attended by considerable expense, difficulties and disadvantages, e.g. destruction of newly-emerged seedlings by birds in the one case and frost-heaving or root injury in the other. Seed is sown in pots very thickly (e.g. 70–80 seeds of Aleppo Pine to a 10-cm. pot) at the end of the summer, and germinates towards the end of September or beginning of October. The seedlings are planted out from November to the end of the winter in ground which has been cultivated in the previous spring. Details are given of the special requirements of *Pinus halepensis*, *P. pinea*, *Cedrus atlantica* and *Cupressus sempervirens*, and relative costs per ha. for these species of direct sowing (average *ca.* 2,000 fr.), planting with 1/0 stock (from *ca.* 1,500 for bare-rooted, to 10,000 fr. for pot plants), and planting with seedlings as above (average 434 fr.). Survival seems to be almost as good as with planting 1/0 pot plants. Experiments are now being made to apply the same method to various species of *Acacia*.

[1779]. 23.24.1 : 12.25 : 12.11.14. THOMAS, G. M., and STADEL, E. L. **Increasing survival of planted conifers with S/V Ceremul C.** *J. For.* 46 (10), 1948 (764–6). 4 refs.

After briefly reviewing earlier experiments in the inhibition of transpiration in newly planted conifers [cf. *For. Abstr.* 7 (No. 387), 8 (No. 81)] the authors describe their own experiments, using S/V Ceremul C, a Socony Vacuum product, as inhibitor. This is essentially an emulsion of wax and water in which triethanolamine is used as an emulsifying agent. Tops only of planting stock (mainly Ponderosa

Pine) were dipped in the solution, and the wax was allowed to dry on the plants before they were set out. Dipping was done while the trees were still in bundles of 50. Treatment cost less than 10 cents per 1,000 trees and was easy to apply. Ponderosa Pine treated with concentrations stronger than 1 part of emulsion to 4 parts of water appeared stunted at the end of the first growing season; where mixtures of 1 part of emulsion to 4 and 6 parts of water were used, the treated plants appeared more vigorous than controls. In all cases survival of treated trees was significantly better than that of untreated ones. To some of the solution a small amount of soil was added, with the idea that clay might cause breaks in the wax coating and improve respiration. This seemed to have the desired effect except in the 1 : 2 solutions. Preliminary experiments with Douglas Fir indicated that concentrations stronger than 1 : 8 may decrease rather than increase survival, and it is suggested that each species of conifer may require a different concentration. Such heavily transpiring species as Douglas Fir may benefit from dilutions as weak as 1 : 10.

[1780]. 23.24.1 : 12.25. CHAPMAN, A. G. **Survival and growth of various grades of Shortleaf Pine planting stock.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (323–31). 2 refs.

An account of experimental plantings of *Pinus echinata* 1/0 planting stock of various height and diameter classes. Better survival and growth rates were obtained from the seedlings with the lower height/diameter ratios. The range of seedlings tested was $\frac{2}{20}$—$\frac{5}{20}$ in. diameter and 4–13 in. height. Diameter was found to be a more effective criterion of survival and growth than stem height.

[1781]. 23.24.1 : 12.26–8 : 23.26. LANDON, F. H. **Planting experiments with Kapur.** *Malay. Forester* 11 (4), 1948 (146–53). 2 refs.

In planting experiments with Kapur [*Dryobalanops aromatica*] in unfavourable weather under the shade of a 20-year-old plantation of *Fagraea fragrans* and other species, planting in bamboo tubes gave 87% survival after 6 months. 'Wrenched' seedlings [by 'wrenching' is meant here the severing of the tap root about 3 in. below the surface with a knife or sharpened trowel without lifting the seedling from its bed] gave about 50% survival, irrespective of whether they were topped, pruned of young leaves, or left with leaves intact. Stripping of all leaves and stumping to 4-in. shoots were unsuccessful. Wrenched seedlings showed a highly significant superiority over transplants and ordinary seedlings. Planting in prepared patches gave significantly better results than planting in small holes for seedlings stripped of young leaves, but not for topped seedlings. *Author's summary.*

[1782]. 23.24.1 : 12.26–8 (676). [***Eucalyptus saligna* planting stock.**] *Rep. For. Dep. Uganda 1947*, 1948 (15).

At Namanve in Buganda 250 acres of cleared forest land were planted with *Eucalyptus saligna* striplings and seedlings. The use of striplings was due to a shortage of plant trays. Their average height was 3 ft. and, although nearly all died back at the tip after planting, they soon flushed again. These striplings had attained anything up to 18 ft. in height and 3 in. in diameter by the end of the year, compared with a maximum height of 3 ft. attained by seedlings. This large-scale experiment had everything in its favour, as the rains were particularly good.

[1783]. 23.24.1 : 12.26–8. [**Comparison of development of transplants of *Hovenia dulcis, Markhamia platycalyx, Morus alba* and *Pterospermum acerifolium.***] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (21–2).

Shows survival % and height growth at end of 1st season of transplants of each of the 4 species, for seedlings transplanted (1) with 2 pairs of old leaves, (2) with all existing leaves, and (3) with only 2 apical pairs of leaves.

[1784]. 23.24.1 : 12.26–8. [**Winter stump planting of *Morus alba.***] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (19).

[1785]. 23.24.1 : 12.26–8. [**Comparison of nursery grown and forest material** (1) **for stumps of *Morus alba*,** (2) **for transplants of *Cedrela toona.***] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (21, 22).

No differences were observed in survival. Height growth was rather better in nursery stock.

[1786]. 23.24.1 : 12.26–8. [**Effect of duration and conditions of storage on survival of stumps of *Cedrela toona.***] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (20).

[1787]. 23.24.1 : 12.26–8. **[Effect of diameter of stump or cutting on survival of *Bischofia javanica* and *Dalbergia latifolia*.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (20–1).

[1788]. 23.24.1 : 12.26–8 (911). **[*Casuarina sumatrana* planting stock.]** *Rep. For. Dep. Sarawak 1947*, 1948 (5).

The most recently planted area of Ru (*Casuarina sumatrana*) plantation was part of an abandoned Para Rubber plantation, the soil of which is even poorer than that of any area previously reclaimed. Ru seedlings averaging 6 in. in height were lifted from the natural forest and planted direct. This technique has never been really satisfactory and in the year under review casualties were heavy owing to a prolonged dry spell soon after planting. Blanks were filled with plants lifted from the nursery and established in small palm-leaf baskets before lining out. This method of planting proved so satisfactory that it will be continued in spite of the increased cost.

23.26. Plant Rearing. Nursery Practice

See also *For. Abstr.* 10 (Nos. 1601–2, 1730, 1768, 1771, 1778, 1781, 2232, 2252–3).

[1789]. 23.26 (410). EDWARDS, J. **The forest tree nursery.** *Quart. J. For.* 42 (4), 1948 (181–8).

Instructions for laying out and managing a small estate nursery.

[1790]. 23.26 (494). Einteilung des Pflanzgartens, Kontrollführung. (Disposition et contrôle d'une pépinière). **[Lay-out of the nursery; seed and stock registers.]** *Merkblatt der Beratungstelle für Waldsamenbeschaffung. (Mémorandum de l'Office de renseignements et conseils pour l'obtention de graines forestières.)* No. 11, 1948. [G.F.] In *Schweiz. Z. Forstw.* 99 (6), 1948 (331–6).

Cf. *For. Abstr.* 10 (No. 219).

[1791]. 23.26 : 12.25 : 23.24.1. SILVERSIDES, C. R. **Does careful selection and treatment of planting stock pay?** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 40 (F–2), 1948. pp. 3.

Describes the methods of selecting Spruce planting stock practised by the Holmens Co. in Sweden. The seedbeds are divided into units 3 ft. square, and the seedlings from each square are lifted, examined, and graded into three classes:—minus (*ca.* 50%), average (*ca.* 40%), plus (*ca.* 10%). All the minus seedlings are destroyed, and the remaining seedlings are transplanted, the 2 classes being kept separate in the transplant beds. After one year there the plants are lifted, examined and graded again. The minus transplants (*ca.* 5%) are destroyed and the remainder placed in 2 groups, average and élite. The average stock is planted on the better sites and the élite stock on the poorer or drier sites or where there is considerable competition from herbaceous growth. The mortality of plants selected in this manner has been found to be only about 5%, and they can be planted at spacings much wider than those normally employed.

Planting stock is never washed, or carried in buckets of water, as it has been found that mycorrhiza are rubbed or washed off when the roots are placed in water.

[1792]. 23.26 (485) : 23.23.15. KARLBERG, S. Några synpunkter på rationalisering av våra skogsplantskolor. **[Notes towards rationalization of forest nurseries in Sweden.]** *Svenska SkogsvFören. Tidskr.* 46 (2), 1948 (144–59). 16 refs. [Sw.]

Brief notes based largely on a tour in Denmark. Reference is also made to unpublished work by S. Sjöström which showed that *Fusarium* infection of seeds can be controlled by immersing them about 1 hour in a 0·2% solution of Germisan or Uspulun, in a *wooden* vessel. Rubber gloves should be worn to avoid the risk of poisoning. Damping-off fungi in the soil can be controlled by spraying seedbeds with Uspulun solution (5 g. Uspulun per sq.m.).

From a tentative comparison of line versus broadcast sowing of Scots Pine and Norway Spruce it is concluded that the latter (the usual method in Denmark) produces more uniform plants with a more compact root system, yields about twice as many plants per unit area and is 30–40% cheaper.

Weeding is discussed with passing reference to the possible, but practically untried, use of chlorates or hormone preparations. Mention is also made of several types of machine used for weeding in Danish nurseries.

Root pruning *in situ* is worth serious attention as an alternative to transplanting. It is

used with success in some Danish nurseries. A simple plant-lifting machine—the 'Hjortsø Plantelyfter'—has a knife (running the breadth of a nursery bed) which will do root pruning or, if set deeper and at a wide angle to the horizontal, will raise earth and plants so that the latter can be lifted by hand plucking. Though proper comparison in detail is difficult, root pruning saves time, labour, and space, compared with transplanting.

[1793]. 23.26 : 24.4 (931). SUTHERLAND, M. **Growing tree stocks for shelter planting.** *N.Z. J. Agric.* 76 (3), 1948 (251–4). O.R.E.

Describes methods of root-pruning, lining out and finally planting out, with special reference to *Pinus radiata*, *Cupressus macrocarpa*, *Pseudotsuga taxifolia*, *Cupressus lawsoniana*, *Cryptomeria* spp. and *Cedrus deodara*, and includes some notes on raising plants from cuttings. [Cf. *For. Abstr.* 9 (Nos. 2213–4).]

[1794]. 23.26 : 23.1 : 12.25 (485). SJÖSTRÖM, H. Några erfarenheter av 'beståndsplantskolor' för tall. [**Some experience with 'wilding nurseries' for Scots Pine.**] *Norrlands SkogsvFörb. Tidskr.* 1947 (2), (216–46). 8 refs. [Sw.]

Cf. *For. Abstr.* 8 (No. 208). The present paper considers the establishment of wilding nurseries (i.e. 'nurseries' established under mother stands of high quality by suitable soil cultivation and stocked by natural seeding) from the points of view of the selection of mother stands, advantages and disadvantages as compared with ordinary nurseries using seed of comparable quality, principles of soil and stand treatment, planting stock obtained, economics and possible future development.

Apart from the requirement of abundant seed of high genetic quality, the sites chosen should be suitable for harrowing, as little shaded and as little subject to root competition as possible; damage to seedbearers, e.g. by cultivation too near their roots, should be avoided; the soil should not be subject to serious frost-heaving and should be worked to give a rough surface which will hold litter and check erosion. The plants should be lifted as 3/0 stock. In 1946 there were 122 such nurseries in various parts of Sweden, carrying some 3·2 million 1-year plants, of which all but 40,000 were Scots Pine. It is estimated that the cost per 1,000 usable plants will average Kr. 13, which will represent a saving of about Kr. 40/ha. as compared with the usual nursery stock, though it is clear that this method can only supplement and not replace ordinary nurseries. The results to date justify continuance of the trials with Scots Pine. In the case of Norway Spruce the difficulty of combating weed growth has to be solved. A few small trials with *Larix sibirica* suggest that the method might also suit this species.

[1795]. 23.26 : 23.1 : 12.26–8 (911). **[Wilding nurseries.]** *Rep. For. Dep. Sarawak 1947*, 1948 (5).

Early in the year and before a heavy seedfall, cleanings were made beneath 159 selected Dipterocarps, including *Shorea* and *Dipterocarpus* spp., with the object of forming natural nurseries to supply seedlings later for experimental plantings in patches of secondary jungle. Excellent regeneration was obtained and the first experiments with lifted seedlings placed in baskets before planting out were very encouraging.

[1796]. 23.26 : 11.15 : 12.11.23 : 21.11. MAKSIMOV, N. A., and LEMAN, V. M. Kul'tura seyantsev drevesnykh na elektricheskom svete. [**Culture of woody seedlings in electric light.**] *Dokladÿ, Moskovskaya Ordena Lenina sel'skokhozyaystvennaya Akademiya imeni K. A. Timiryazeva* No. 3, 1946 (46–51). [Russ.] C.G.B.

Seedlings of tree and shrub species have been grown under various combinations of natural and electric light (using 500- to 1,000-watt lamps).

The artificial illumination received by most of the plants was of 1,000–3,000 luxes. Plants were grown in small pots in ordinary soil, and watered as necessary, once or twice a day. An air temperature of about 20° C., and a relative humidity of 60–70% were maintained.

Results for the first 10 months were as follows:—(1) Woody seedlings grown since the spring with 16 hours' daylight + 8 hours' electric light or with 24 hours of electric light per day, were by August much taller than controls (grown in natural light), and continued to grow during the winter. By the succeeding spring the heights of some species were many times (up to 14 in the case of *Quercus robur*, those of the controls, in addition to which stronger branching, more numerous leaves, and sometimes hypertrophic increase (by 3–4 times in Scots Pine) in length and diameter of needles, were observed. (2) Increase in the

size of seedlings grown through the winter in continuous light, was largely accounted for by a curtailing of the dormant period. Seedlings of Apple, Cherry, Maple, Ash, Lime, *Cytisus*, *Colutea* and *Euonymus*, stopped growing and shed their leaves 1–3 months later, and mostly resumed growth in spring 1–1½ months earlier, than controls. Seedlings of Scots Pine, Larch and *Caragana arborescens* made a short rest (2–3 months) in the middle of the winter and then resumed growth. Larch and *C. arborescens* shed only a few of their lower leaves. (3) Seedlings of *Quercus robur* responded remarkably to continuous electric light, reaching by the end of 10 months a height of over 1·5 m. and putting out about 100 leaves, whereas controls were 6–10 cm. tall and had 4–6 leaves. From the time of seedling emergence onwards, the continuously illuminated plants did not shed leaves or stop growth and leaf formation, except for a slowing down (6–10 days) and a brief cessation of growth before the appearance of each new 'annual' shoot, of which up to 9 were observed in the months of the experiments, the final height of such seedlings being comparable to that of 5- to 6-year-old seedlings grown in natural conditions. (4) Duration of illumination per day is an important factor. Thus Oak seedlings given only 12 hours' intensive illumination per day (in spite of a warm environment and retention of their leaves) ceased growth for 5 months and produced only one 'annual' shoot; whereas Oak seedlings sown at the same time but grown in continuous light, produced in the same period 4–5 shoots and reached over 70 cm. in height. Seedlings of some other woody species have shown analogous behaviour.

The experiments, started in 1944, are expected to last until 1949. [Cf. *For. Abstr.* 9 (No. 100).]

[1797]. 23.26 : 11.15 : 12.11.23 : 21.11 : 21.8. GULISASHVILI, V. Z. Narushenie pokoya, periodichnosti vegetatsii i ritmiki rosta u nekotorykh drevesnykh porod v usloviyakh svetokultury. **[Breaking dormancy, periodicity and rhythm of growth in some tree species by cultivation in electric light.]** *Priroda, Moskva* 37 (3), 1948 (63–6). 13 refs. [Russ.]

Starting from the assumption that both dormancy and the rhythm of growth of woody species are largely determined by climatic factors, the experiments described included both native and exotic species of cold, moderately cold, moderately warm, and subtropical regions. Seedlings 3–4 years old were grown: (*a*) in continuous electric light (two 1,000-watt lamps at a distance of 70 cm. from the plants); (*b*) with 'supplementary electric light' [daylight supplemented by an unspecified period of electric light] supplied as under (*a*); (*c*) in natural light (controls). Air temperatures were kept at 18–25° C. The experiments lasted 2 years.

(1) Two methods of breaking dormancy were tried on a number of species: plants were brought into continuous artificial light (i) on Oct. 29, just after leaf-fall, or (ii) on Jan. 9, after being held for a time at low temperatures (down to −5·2° C.). Dormancy was broken more rapidly with method (ii); species of cold climates, under this method, broke dormancy with greater difficulty than those of warmer ones. In some species, e.g. *Quercus macranthera*, *Carpinus betulus* and *Liriodendron tulipifera*, it was extremely difficult to break dormancy by method (i). Some species, e.g. *Pinus sylvestris* subsp. *hamata*, *Eucalyptus sideroxylon* and *Cupressus cashmeriana*, would not tolerate cultivation in electric light at all.

(2) Many species broke dormancy more rapidly under continuous than under supplementary electric light, e.g. *Carpinus* resumed growth after 30 days in the former as against 53–88 days in the latter. Some species, e.g. *Phellodendron amurense* and *Acer campestre*, broke dormancy after practically identical periods irrespective of light treatments.

(3) The amount and periodicity of growth in cold-climate species (*Q. macranthera*, *Acer trautvetteri*) was little affected by either continuous or supplementary electric light.

(4) Among species from moderately cold climates some (*Acer campestre*, *Carpinus orientalis*) behaved like those under (3), but the majority (e.g. *Quercus iberica*, *Fagus orientalis*, *Carpinus betulus*, *Betula verrucosa* and *P. amurense*) reacted positively in both continuous and supplementary electric light. Under the continuous light *Q. iberica*, *F. orientalis*, *C. betulus* and *P. amurense* became evergreen and showed 5–6 or more growth periods per year, while *B. verrucosa* grew steadily and practically constantly, with imperceptible rest periods. Under supplementary electric light the duration of the leafy period was generally extended:

Q. iberica, and *B. verrucosa* became practically evergreen and the latter species showed almost continuous and uniform growth, while the former and *Carpinus betulus* had 3–4 growth periods per year. For the most part this group of species far outgrew controls under both the artificial light treatments.

(5) Deciduous species of moderately warm climates (*Catalpa speciosa*, *Morus alba*) became evergreen and grew practically continuously and constantly under the continuous light.

(6) Subtropical species (*Acacia melanoxylon*, *A. longifolia*, *Pinus pinea*, *Quercus suber*) differed from the preceding groups in that continuous electric light mostly gave less height growth than the 'supplementary' light treatment, and in the *Acacia* spp. resulted in even less growth than that of controls. For this group the 'supplementary' treatment was generally the most favourable.

[1798]. 12.26 : 12.26–8 (81) : 23.23. VEIGA' A. DE A. Os primeiros estudos sôbre o cedro. **[Preliminary studies on *Cedrela*.]** *Rev. Agric., Piracicaba* 21 (11/12), 1946 (459–63). [Port.] C.G.B.

Although Cedro Rosa (*Cedrela* sp.) can be propagated from cuttings and regenerates naturally with ease, nursery seedlings have proved the best for obtaining vigorous and healthy trees. The fruits are gathered between April and July and dried in the sun for several days to facilitate extraction of the seeds. About 1,120 green seeds weigh 50 g., but drying in the sun for 9 days reduces the weight to 25 g. Broadcast sowings are made in soil composed of 1 part sand and 2 parts humus. The seeds are de-winged, then sown in still weather, by watering and covering with a light layer of soil, so that they are not displaced or lost. Germination is not more than 70–74%; good results have been obtained with 25–30 g. of seed per sq. m. They germinate in about 20 days and the seedlings are potted out at 10–20 days of age. They are finally planted out on reaching a height of 12–25 cm. When sown between May and June they should be ready for transplanting in the rainy season.

[1799]. 23.26.4. **[Treatment of nursery soils.]** *Rep. For. Comm., Lond. 1947*, 1948 (38).

Work on the partial sterilization of old nursery soil, using steam and chemical methods, was continued, and further confirmation of the beneficial effects of such treatment in certain 'sick' nurseries was obtained. An incidental advantage from steam sterilization is the killing of weed seeds, and the saving in weeding costs very largely offsets the high cost of this method of sterilization. It was discovered in the course of nursery experiments that one reason why many old nurseries no longer produce good seedlings is that they have, in the course of time, become too alkaline. Acidification experiments are in progress to try to remedy this condition.

23.27. Arboriculture

See also *For. Abstr.* 10 (Nos. 1664, 2217).

[1800]. 23.27 (764). LEWIS, R. D. **Ornamentals for southeast Texas.** *Bull. Tex. agric. Exp. Sta.* No. 695, 1947. pp. 64. 7 refs.

Notes include height, spread, rate of growth, resistance to root-rot and to cold and sun, methods of propagation, and uses of shade trees, evergreen and flowering shrubs, climbers, etc.

23.3. *Afforestation*

See also *For. Abstr.* 10 (Nos. 1715, 1722, 1756).

[1801]. 23.3 (438) : 11.62.11. PEJTA, P. Wydmy i lasy nadmorskie oraz utrwalenie brzegów. **[Sand dunes, coastal forests and coastline fixation.]** *Wydaw. pomocn. tech.-gosp. Inst. Bad. Leśn., Kraków* No. 11, 1947. pp. 71. [Pol.]

The incorporation into Poland of the German Eastern provinces increased the Polish coastline to 500 km. and brought forward the problem of its protection. The author describes the methods used prior to 1939 for fixing dunes and for the protection of cliffs and estuaries on the short stretch of coast then in Polish hands, methods which he believes may be useful for protecting the present long coastline. As sand-binders he recommends *Ammophila arenaria* and *Elymus arenarius*, followed by *Pinus nigra*, which is preferable to *P. sylvestris* and *P. banksiana*, for establishing the dune forest itself. The two latter Pines, however, are quite suitable for the second-line coastal forests that shelter behind it, along with Weymouth Pine, European Larch, Spruces, and such hardwoods as Birch, Rowan, Willow, Maple, Grey Alder, and in some cases even Sessile Oak

and Ash. That the latter two species are able to survive at all, shows that the establishment of mixed forests, with their greater resistance to insect epidemics, is possible. The raising of seedlings and the methods of planting are discussed in some detail. As regards the protection of cliffs the author emphasizes that when their slopes are bare (generally they are under Beech or Beech/Pine protection forest) and steep, pipe drains to prevent erosion should be laid before the actual planting is done. For planting, both Pedunculate and Sessile Oak, Scots Pine, Grey and Black Alder, Maple, Ash and Beech have been found suitable; as Beech requires shelter it can be introduced either after the Pine, or if, as often happens, there is a growth of *Cytisus scoparius*, before it. The protection of estuaries is discussed very briefly, the author not believing it to be necessary unless there are important coastal installations. The booklet is intended for foresters engaged in coastal protection and for recruits to the work, who are urgently needed.

[1802]. 23.3 (45) : 11.48.6. CRIVELLI, D. Note sull' esito degli esperimenti di rimboschimento eseguiti nei 'magredi' del alta pianura occidentale friulana. [**Notes on the result of afforestation experiments on the young gravel soils of the western plateau of Friuli.**] *Ital. for. mont.* 3 (3), 1948 (162–6). [It.]

These experiments were begun in 1937. The soils in question consist of a humus layer only 10–12 cm. deep, over recent deposits of river gravels. After 10 years' growth, it appears that the most suitable of the species tried are Swiss and Scottish races of *Pinus sylvestris*, *Fraxinus ornus* and *Carpinus betulus*. The Pines seem to be particularly well suited to the site, having reached heights of 1·3–2·5 m. in 10 years. *Pinus nigra* proved a failure; *Robinia pseudoacacia* and *Ailanthus altissima* made a good start, but later suffered from chlorosis and also had a tendency, owing to their prolonged vegetative season, to suffer frost damage. *Chamaecyparis lawsoniana* shows considerable promise.

[1803]. 23.3 (471) : 12.25. NUORTEVA, M. Metsänviljelyä männyn metsänrajan pohjoispuolella. [**Afforestation with Scots Pine north of the timberline.**] *Metsät. Aikak.* 1948 (1/2), (14–6). [Fi.]

An account of attempts at afforestation in the northernmost part of Finland (north of Lake Inari) started some 40 years ago. These experiments started at Harrisuvanto in 1911–2, on a plot of 10 ha., 6 ha. being sown broadcast, 2 ha. in prepared patches, and 2 ha. in plough furrows. Of this plot, only one ha. sown in patches has proved a success. On the rest of it the few survivors are in poor condition. The author thinks that failure may be attributed to using seed of too southern origin, for on another plot of some 13 ha. in the same area, sown in 1913, development had been good. Some 6 ha. had been sown broadcast, after the ground had been burnt over, another part had been sown broadcast on scarified ground, and still another sown in furrows. Growth was best on the burnt-over ground, where thinnings had already been done, but was good throughout. In the same area, other plots had been sown in 1915, 1921, 1922 and 1923, some developing successfully, others not. Here, too, sowings on burnt-over ground had done very well. Another 200 ha. or so, furrow-sown in 1937–9, showed parallel results.

Similar trials along the river Utsjoki since 1924 had the following results: (1) 15 ha. broadcast-sown in 1924, in prepared patches, successful, growth up to 3 m. high; (2) 15·5 ha. broadcast in 1924–5, successful in sheltered places, with clumps requiring thinning; (3) sown in 1929, 50% failed; (4) 30 ha. sown on the snow in 1927 after the ground had been burnt over, very successful, (5) 100 ha., furrow-sown in 1937–41, part on burnt-over ground, part not, development good only on the burnt-over portion.

Similar attempts elsewhere are described. Further work is planned in the Tana River basin, where some 7,000 seedlings have already been planted out in recent years. Near the place where the Utsjoki and Tana rivers join, a nursery, probably the northernmost nursery in the world, is producing seedlings from seeds harvested from the few Pine trees of the area.

The author draws attention to the greater vigour of seedlings raised on burnt-over ground, and asks whether the climate is changing for the better in the Arctic.

[1804]. 23.3 (661) : 11.62.11 : 23.21. CHEVALIER, A. Quelques plantes de couverture existant déjà ou à répandre en Afrique occidentale française. [**Some cover crops already**

existing in French West Africa, or suitable for introduction there.] *Rev. int. Bot. appl. Agric. trop.* 28 (305/6), 1948 (144–50). 4 refs. [F.] P.R.

Lists, with brief descriptions, the trees, shrubs and herbaceous plants suitable for erosion control in W. Africa, and a few trees suitable for reforestation there.

[1805]. 23.3 (675) : 11.62.11 : 43 : 34.21. Loeckx, M. A. Erosiebestrijding in het Gewest Mahagi. [**Erosion control in the Mahagi Territory.**] *Bull. agric. Congo belge* 39 (3), 1948 (511–30). [Flem.f.]

The author describes the Alurs country in Mahagi Territory in the north-west of the Belgian Congo near the Uganda border. The primary cause of erosion is density of population (70–100/sq. km.). The plantations of *Acacia decurrens* and *Cupressus* spp. afford little protection to the soil, and signs of erosion are particularly noticeable under *Cupressus*. The creation of natural forests by fire-protecting the savanna and enriching natural stands, is recommended. Direct sowing of *Tephrosia* sp., *Cassia laevigata*, *C. didymobotrya* and *Erythrina abyssinica*, gave promising results on fallow covered with couch-grass, without any preparatory cultivation. Cuttings of savanna species on similar sites were unsuccessful. Contour-strip cropping, with alternate fallow strips is an efficacious anti-erosion measure which is readily accepted by the natives. Other measures recommended are experimental afforestation for soil improvement, planting fire-breaks (*Acacia decurrens* and *Ficus* spp. are suitable for this purpose), and experiments in management of pasture in paddocks. *Caesalpinia sepiaria* is recommended for paddock hedges. The cost of preparing such paddocks was estimated at 200 (Belgian) francs per ha. in 1946. [Cf. *For. Abstr.* 10 (Nos. 1812–3).]

[1806]. 23.3 (675) : 97.1. Loeckx, A. Note sur un essai d'enrichissement de la jachère naturelle. [**An experiment in the enrichment of natural fallow.**] *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (182–91). [F.]

An attempt was made in 1945 on fallow land in the Mahagi territory of the Belgian Congo, to re-establish savanna vegetation (1) by broadcast sowing of leguminous species; (2) by line sowing of the same species (*a*) with, and (*b*) without subsequent cleanings; (3) planting with cuttings of *Erythrina abyssinica*, *Albizzia stipulata* and *Entada abyssinica* spaced 1 m. apart in lines 2 m. apart; (4) planting with rootstocks of *Pennisetum purpureum* spaced 1 m. apart. Control plots (*a*) unburned, and (*b*) burned annually, were also established. Lack of replication makes it impossible to draw final conclusions from this experiment, but the results to date justify the following conclusions: Broadcast sowing of *Tephrosia* sp., *Cassia laevigata*, *C. didymobotrya*, *Caesalpinia saepiaria* and *Erythrina abyssinica* without any preparation of the ground, may be considered a practical and economical method of enriching local fallows. Sowing in lines gives better results, and two cleanings markedly improve both the number and development of the leguminous seedlings. Planting with *Pennisetum* rootstocks was uniformly successful, but this species is much more vulnerable to bush fires than the leguminous species. Planting with cuttings was a complete failure.

[1807]. 23.3 (676) : 91.4 : 12.26–8. **Anti-malarial plantations.** *Rep. For. Dep. Uganda 1947*, 1948 (15–6).

A successful start was made with anti-malarial planting at Namasagali, where 30 acres of swamp were planted with *Eucalyptus saligna* in early April. Notwithstanding very heavy flooding at the end of the month and in early May, reasonable establishment was obtained. Most of the cleaning in this plantation was done with an 'Anzani' tractor, which proved a great success as long as the soil was reasonably dry.

Silvicultural work in similar plantations in the Eastern Province confirmed the belief that where closed canopy is required in stands on marginal sites, a very heavy outlay must be budgeted for. The only operation which will benefit such areas is intensive clean hoeing, coupled with draining where there is water-logging. Clear felling in the anti-malarial plantations at Gulu proved a mistake, since neither *Cassia siamea* nor *Eucalyptus robusta* coppiced well in the parts liable to flooding, and a heavy growth of grass resulted. The replacement of clear felling by double-line cutting proved impracticable and selection felling was substituted.

[1808]. 23.3 (73) : 11.49.5 : 42.31 : 21.2. Silker, T. H. **Planting of water-tolerant**

trees along margins of fluctuating-level reservoirs. *Iowa St. Coll. J. Sci.* 22 (4), 1948 (131–47). 6 refs.

A thorough sampling was made of 1,100 acres of water-tolerant tree plantations, 5–12 years old, along the margins of fluctuating reservoirs on the lower Tennessee River. Data on survival, height, and adaptation of trees to changing water-tables and to soil and ground-cover conditions were obtained for *Taxodium distichum, Quercus nigra, Q. phellos, Fraxinus pennsylvanica* var. *lanceolata, Liquidambar styraciflua, Nyssa aquatica, Chamaecyparis thyoides,* and *Platanus occidentalis.* Results are presented for 2 kinds of reservoir-margin sites:—

(1) Reservoir surcharge zone plantations, 1–15 ft. above normal pool level and infrequently flooded during the dormant season, have been more affected by inherent soil moisture than by water surcharge levels. Surcharge water covering some areas 2–7 ft. deep throughout the dormant season has caused no apparent damage, e.g. *T. distichum, N. aquatica,* and *L. styraciflua* plantations flooded by 2–4 ft. of 'trapped' water throughout June of the 3rd growing season. These plantations averaged 11–90% survival and 3·5–14·3 ft. total height growth after 5 growing seasons.

(2) Growth of 9- to 12-year-old plantations of *T. distichum, N. aquatica* and *C. thyoides* in the upper drawdown zone intermittently covered by 1–3 ft. of water is as good as, or better than, that of upland plantations of fast-growing conifers or hardwoods. Sites made unfit for agricultural use because of water-level fluctuation offer considerable promise for timber production.

Results show that:—*N. aquatica* should be planted on seepage areas or sites intermittently flooded during the growing season; *T. distichum* and *C. thyoides* are adapted to the same sites as *N. aquatica* but can be planted at higher elevations on all but the drier and poorer terrace soils; *F. pennsylvanica* var. *lanceolata* is adapted to all sites except those subject to prolonged flooding during the growing season; *Q. nigra* and *Q. phellos* have not been subjected to intermittent flooding during the growing season, but offer promise for wildfowl cover and food on all but the drier and poorer terrace soils; *L. styraciflua* and *P. occidentalis* are the better species for planting on the better soils in the upper part of surcharge zones [cf. *For. Abstr.* 8 (No. 2698); 10 (No. 2216)]. *From author's summary.*

[1809]. 23.3 (75) : 11.62.11 : 56 : 12.25–9. GIBBS, J. A. **Growth of tree plantings for erosion control in the Southeastern Region.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (371–86).

During the past 13 years about 180 million trees have been planted in the Southeastern Region of the U.S.A. as part of an erosion-control programme. Observations and measurements of the early plantings lead to the following conclusions:—(1) Protection from both grazing and fire is a major essential in the early establishment of forest cover, as well as for the encouragement and preservation of early natural invasion by both annual and perennial herbs and grasses. (2) The Pine species (*P. taeda, P. caribaea, P. echinata, P. palustris, P. rigida* and *P. virginiana*) have survived and grown well, *Robinia pseudoacacia* and other hardwoods badly. Results indicate the advisability of close spacing (6 × 6 ft. on an average, and closer on severely eroded spots and gullies) to bring about early establishment of ground cover. Much emphasis is laid on the need for examining and beating up plantations in the 1st and 2nd years. (3) Pine plantings, over a wide range of conditions, have established ground cover and completely controlled erosion in 8–10 years, though longer is needed in some of the worst eroded sites. (4) Insects such as the Black Locust borer (*Cyllene robiniae*) constitute a limiting factor in the use of Robinia for erosion control. *Cronartium* (*Cronartium fusiforme*) cankers were frequently found, but were confined mostly to Slash and Loblolly Pines. In most cases infected main stems can be eliminated in the first thinnings without seriously reducing stand density. (5) In general, preparation of the planting site by ploughing, furrowing, ridging, bank sloping, dam construction, etc., has not resulted in significantly improved growth and survival.

Figures are given of average annual increment (diameter, height, volume) for all species used.

[1810]. 23.3 (83) : 12.25 : 85 : 94.33 : 56. [HALE, W. F.] **Chileans sell forestation bonds.** *J. For.* 46 (9), 1948 (686).

Capitanac, a private financing company in Santiago, Chile, urges investors to avoid the

dangers of inflation by making small monthly, semi-annual, or annual payments towards a forestation bond guaranteeing the delivery of a stated quantity of Pine lumber at a future date. Capitanac uses *Pinus radiata* exclusively in its planting operations. This species grows rapidly in central Chile, having a rotation of 30–35 years. Trees are planted 2 m. apart and are thinned after 10 years. An example is noted of a tree which was 32 ft. tall and 22 in. in diameter at 23 years of age. A monthly lottery allows one bondholder to obtain his capital immediately and a specified volume of wood after 5 years. After the second year a bondholder may withdraw his investment if he wishes or, if he prefers, he can wait until the expiration of his time limit and then have his lumber delivered or accept its market value on the day he liquidates. Capitanac covers all the risks which could affect its Pine plantations and assures their care and harvesting without any charge to the subscriber.

[1811]. 23.3 (922) : 11.62.11 : 97.1 : 23.52 : 23.21 : 44.1 : 12.29. VOOGD, C. N. A. DE. De bosculturen van Janlappa. [**The Janlappa forest plantations.**] *Tectona* 38 (2), 1948 (63–76). 4 refs. [Du.e.]

Describes the difficulties experienced in reforesting land eroded by shifting cultivation in the Janlappa forest reserve, W. Java (rainfall 2,020 mm., enough falling even in the dry months; soil moisture-retentive but sufficiently permeable, markedly P-deficient). Notes are included on vegetation, plantation trials, measures against *Imperata cylindrica* in the older plantations, planting stock, the species used, and development of the area (roads, etc.).

Only *Schima bancana*, *Fagraea fragrans* and *Swietenia macrophylla* have given good results. *Leucaena glauca*, tried as a cover crop, was a failure, and dense *Imperata* in the older plantations hinders the growth of the trees. In 1939 *Cassia multijuga* and *Acacia auriculiformis* were sown between rows in the new plantations; these have both grown well and prevented *Imperata* from gaining a foothold. The best results were given by a mixed plantation of *S. bancana* and *F. fragrans*, with *C. multijuga* as a cover crop.

Attempts to control *Imperata* in the older plantations by large-scale sowing of *Clibadium surinamense* were locally successful, but seed of this species shows very irregular germination. As its spread in Java may be due to distribution by birds, the seed might possibly benefit from pre-treatment, e.g. with boiling water.

23.4. *Formation of Forest by Natural Succession*

See also *For. Abstr.* 10 (Nos. 1572, 1805).

[1812]. 23.4 : 12.19.4 (675) : 12.26–8 : 97.1. LOUIS, J. La phytosociologie et le problème des jachères au Congo. [**Phytosociology and the problem of forest fallows in the Congo.**] *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (916–23). [F.]

Discusses the question of succession on forest fallows, with particular reference to the secondary forest of *Musanga smithii*, of which profiles are given.

[1813]. 23.4 : 12.19.3 (676) : 43.1 : 12.19.4. [**Fire protection of savanna areas.**] *Rep. For. Dep. Uganda 1947*, 1948 (17).

Fire-protected savanna areas in Lango and Acholi were for the most part successfully guarded in 1947, but a halt has been called in the programme of extension to see if the expense is justified. In the drier areas it seems definite that it is not. Elsewhere, after 5 years' protection, lateral growth is fair, though nowhere thick enough to kill out grass completely, but height growth is disappointingly poor. Only in areas where *Albizzia zygia* is common does there appear to be a fair chance of success. *Grewia mollis* and *Combretum binderanum* are other useful species in bush thickening.

23.5. *Underplanting. Nurses*

See also *For. Abstr.* 10 (No. 1811).

[1814]. 23.51 : 12.25. JAMES, N. D. G. **Underplanting.** *J. Land Agents' Soc.* 47 (11), 1948 (285–6).

A brief account of general principles illustrated by the history of a plantation of mixed European and Japanese Larch underplanted when 4 years old with *Abies nordmanniana*. The Larch was finally removed in 1943 at about 40 years and the Fir soon recovered from felling damage and is now growing well.

[1815]. 23.51 : 12.26–8 (676) : 33.53 : 34.25. **[Possible use of *Cinchona* as understorey.]** *Rep. For. Dep. Uganda 1947*, 1948 (24).

Barked *Cinchona* poles are very durable and termites avoid them, hence it is suggested that *C. ledgeriana* might be worth growing as an understorey in timber plantations, for the supply of building poles, and perhaps also as a nurse species, for it is very fast growing. If, contrary to present belief, natural quinine is not replaced by synthetic, the bark would yield a welcome addition to forest revenue.

[1816]. 23.51 : 12.26–8 : 34.25. Étude des modes d'ouverture et d'aménagement des cacaoyères. **[Study of methods of establishing and managing Cacao plantations.]** *Rapp. Inst. nat. Étude agron. Congo Belge 1944–5*, 1947 (54–6). [F.]

This experiment, started in 1940, was designed to show the comparative advantages of the following methods of establishing Cacao plantations:—(1) in burnt forest, with artificial shade (the standard method); (2) in felled, but not burnt, forest, with artificial shade; (3) as (2) but with natural (regrowth) shade; (4) in thinned forest. The mean yield from (2) was 80 kg./ha. compared with 102 kg./ha. from (1) at the same age and there was great variation from plot to plot. The mean yield from (3) was only 62 kg./ha., and this inferiority to (2) is ascribed to the very irregular distribution of shade provided by the natural re-growth. The growth of Cacao under treatment (4) was markedly inferior to (2) and (3). Cacao plants disappeared entirely from the neighbourhood of some forest species, and it is concluded that this is due to competition for water, since the phenomenon was particularly noticeable during a period of drought.

[1817]. 23.52 : 12.25 : 12.26–8. **[Broom as nurse to Sitka Spruce.]** *Rep. For. Comm., Lond. 1947*, 1948 (38).

Striking results have been obtained by the use of Broom [*Cytisus scoparius*] as a nurse to Sitka Spruce on difficult moorland sites, plants with Broom nurses growing well and fast, while those without remained in check or grew very slowly. A similar effect has been observed with Scots Pine as a nurse for Sitka Spruce, but this is slower in developing.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

[1818]. 24.2 : 12.25 (485) : 12.19.23 : 12.19.4 : 11.42.3 : 11.62 : 64. GABRIELSON, G. Mark- och ståndskogsstudier inom Kristinehamns revir. **[Studies of soil and forest in the Kristinehamn forest range [S.E. Värmland].]** *Suppl.* to *Svenska Skogsv-Fören. Tidskr.* 1948. pp. 55. 21 refs. [Sw.g.]

Mixed Norway Spruce Scots Pine forest on a high, level plateau (altitude 160 m. and more) in this district, is invaded after heavy thinning, as well as in gaps and relatively open stands, by *Vaccinium myrtillus* and then, if the opening is continued, by *Calluna vulgaris*. Simultaneously the diameter increment of the trees declines. Regeneration in these stands is difficult, though below the plateau no difficulty is experienced. The present paper, after a general account of the region, its climate and geology, describes studies of soil conditions, ground flora and tree growth on plots in stands with undegraded ground flora (moss carpet, chiefly of *Hylocomium* spp.), with *V. myrtillus*, and with *C. vulgaris*.

The results, which are tabulated, showed that the mechanical and mineralogical composition and the general moisture conditions of the soils were very uniform. The mor layers, however, increased in thickness and became more matted, and pH (especially that of the litter layer) decreased as succession proceeded towards the *Calluna* stage. There were only feeble variations in the contents of N, organic matter and sand. The highest ash content was found in the undegraded plots. Measurements of diameter increment showed that the trees were growing best on the unthinned, rather worse on lightly thinned and worst on heavily thinned plots. As these phenomena do not occur where calcareous rocks exist and the mineralogical composition of the moraine soils is better, their cause is seen in severe leaching of the rather poor moraine soils in question. Reference is made to Stålfelt's work on the water régime of Spruce [see *For. Abstr.* 7 (No. 566)], and it is urged that soil degradation on the Kristinehamn plateau must be a result of decreased interception of precipitation and decreased water consumption by the stands after thinning.

In future heavy thinning should be abandoned and the stands kept as dense as possible.

In regenerating, measures favouring pure Pine should be avoided and Spruce encouraged. Stands as yet unaffected should be regenerated by practically clear fellings, leaving only seed trees. Gappy and open stands should be clear felled and regenerated by planting.

[1819]. 24.2 : 65 : 57 : 12.25 : 12.26–8. KRENN, K., and REINHOLD. Durchforstungskriterien der wichstigsten Holzarten. [**'Thinning criteria' for the most important tree species.**] *SchrReihe bad. forstl. VersAnst.* No. 5, 1947. pp. 24. [G.]

Presents and describes the construction and use of tables for more or less even-aged stands of Norway Spruce, Silver Fir, Scots Pine or Beech, in which a minimum permissible stocking may be read off, in terms of a critical number of stems per 0·1 ha. (the size recommended for the temporary sample plots used), against mean stand diameter. These are based on Wimmenauer's principle that, for a given species and mean diameter, closed stands will show the same stem number and basal area irrespective of site quality. Comparison of the actual with the critical number of trees per unit area may show a surplus available for thinning or a deficit: in either case the amount can be found in the same tables as timber volume (tables 1–4) or tree volume (tables 5–8) per ha.

[1820]. 24.2 : 12.25 (931) : 23.24.3 : 57 : 76. BAIGENT, L. E. H. **Some notes on the establishment, silviculture and milling of *Pinus radiata* in Nelson district, New Zealand.** *Aust. Timb. J.* 14 (5), 1948 (317, 319–20, 339).

Since certain strains of *Pinus radiata* do not produce excess laterals when grown in open stands, it was decided, when creating plantations in Nelson district, New Zealand, to adopt 9 × 9-ft. spacing, in order to eliminate costly thinnings and obtain early profits. The first signs of suppression in *P. radiata*, grown under these conditions, appear 14 years after planting. A first thinning made at this age, by taking out 'dominant' and 'wolf' trees (measuring 13–15 in. d.b.h. under bark) would provide good sawlogs, and, even at a stumpage rate of 2*s.* 6*d.* per 100 bd. ft., a return equal to the total cost of the plantation. After the removal of these suppressive influences, the 'co-dominants' would become 'dominants' and would be selected as final crop trees, while the 'intermediates' would grow to sawlog size before being thinned in their turn. In a 1,850-acre plantation spaced 8 × 8 ft., thinnings were begun 11 years after planting and took 8 years to complete, producing an average of 6,382 bd. ft. per acre. Operations then began, to thin out the original 'intermediates' (now 19 years old), and are not yet completed, but it is estimated that, after this second thinning, the stand will already have yielded about 16,000 bd. ft. per acre, while there is still a good final crop (estimated at not less than an average of 60,000 bd. ft. per acre) to come. A crop rotation of 35 years is aimed at, since the growth of *P. radiata* in plantations slackens after that age, and wind damage increases. Figures from the Nelson experiments show that the net cost of establishing and maintaining a plantation for 14 years is £7 8*s.* 8*d.* per acre, and this cost would be more than met by returns from the first thinning, since 6,328 bd. ft. at 2*s.* 6*d.* per bd. ft. = £7 19*s.* 7*d.* [Cf. *For. Abstr.* 7 (No. 189).]

[1821]. 24.2 : 12.25. STAHELIN, R., and WARE, L. M. **Characteristics of natural Loblolly stands under different degrees of thinning.** *Rep. Ala. agric. Exp. Sta. 1945–6*, 1948 (30).

Experiments were begun in 1927 on 3 areas well stocked with *Pinus taeda* reproduction about 3 years old. On one plot (*a*) the trees were thinned to 16 × 16 ft., on the 2nd (*b*) to 6 × 6 and on the 3rd (*c*) the natural stand of about 3,000/acre was left. Thinnings were made again in 1945 when the stand was 20 years old; total volume was then (*a*) 19 cords, (*b*) 47 cords, and (*c*) 55 cords per acre. Number of trees 10 in. d.b.h. and above was (*a*) 65, (*b*) 141, (*c*) 50.

[1822]. 24.2 : 12.26–8 : 24.31 : 44.1. **Early thinnings.** *Malay. Forester* 11 (4), 1948 (172–3).

Remeasurement of two Kapur (*Dryobalanops aromatica*) thinning plots in Johore have shown the danger of making heavy thinnings before the girdled trees in the overwood have fallen and while the young crop is small enough to be overtaken by climbers and secondary species. Heavily thinned blocks suffered severely from climbers and weed species, while trees damaged by the falling overwood had no near neighhours to replace them.

24.3. *Opening of the Canopy. Release and Improvement Fellings (including Poisoning and Girdling)*

See *For. Abstr.* 10 (Nos. 1822, 2227–9).

24.4. *Shelterbelts. Windbreaks*

See also *For. Abstr.* 10 (Nos. 1756, 1793, 2227).

[1823]. 24.4 (931) : 23.21 : 60.31.2 : 12.26–8. Sutherland, M. **Multi-purpose trees for planting on farms.** *N.Z. J. Agric.* 77 (1), 1948 (19–25). O.R.E.

Discusses species of Willow and Poplar useful for shade trees, soil stabilization and the formation of shelterbelts in New Zealand. *Salix babylonica* makes a useful shade tree and *S. caprea* is recommended for windbreaks, except in areas where it has been declared a noxious weed and planting is prohibited. Care should be taken that prolific root formation or bent trunks do not obstruct waterways. Unwanted growth needs to be checked by ring-barking and poisoning the main shoots with $NaClO_3$ or arsenic. *Populus nigra* var. *italica* is used chiefly in windbreaks. It can be planted in single rows or in double rows with triangular spacing, the rows being 6–9 ft. and the trees 5–8 ft. apart. Trees planted in double rows may be cut back when they are 20 ft. high, reducing them to a height of 2 or 3 ft., each row being done alternately at intervals of 4–5 years. If the Poplars are allowed to grow to their full height, hedges of Barberry [*Berberis* sp.], Privet [*Ligustrum vulgare?*], *Elaeagnus*, etc., may be established 2–3 ft. from the trees, or an alternating row of *Chamaecyparis lawsoniana*, *Cupressus lusitanica* var. *benthamii*, *Phormium tenax* or Pampas grass can be planted, the two rows being 6–8 ft. apart. To prevent harm to gardens and orchards by suckering from the widespread Poplar roots, trenches 4–5 ft. deep should be dug, cutting through all roots, the trenches not being nearer than 10 ft. to tall Poplars.

[1824]. 24.4 (943) : 60.2 : 23.21. Abell, T. **Shade trees and windbreaks on the pig farm [in Queensland].** *Qd. agric. J.* 65 (1), 1947 (74–84). L.S.

Where pigs are run in paddocks some provision should be made for shelter from the hot summer sun and from cold winter winds, in addition to dry sleeping quarters. This can be done cheaply and profitably by planting the most suitable trees. Windbreaks also help to prevent wind erosion of the paddocks. Shade trees should carry a fairly dense foliage on branches well spread out from the ground. It is necessary to prune the lower branches from some in order to give ample clearance from the ground and allow the early morning sunshine to penetrate beneath the tree and help keep the ground sweet and dry. Deciduous trees are useful in certain positions, as they provide shade in summer, and let the sun in to sweeten the ground in winter. Mulberry and Jacaranda are good examples and will grow in a wide range of soils provided there are no severe late frosts. Other good shade species are Mango, Weeping Fig, *Poinciana*, *Cinnamomum camphora*, *Celtis sinensis* and *Grevillea robusta*. The exotic Pines, *Pinus patula*, *P. longifolia*, *P. radiata*, *P. caribaea*, and *P. taeda*, make good shade trees if the lower branches are removed to give head room, and the broad-leaved Pepperina (*Schinus terebinthifolius*) is a useful species, as it flourishes under a wide range of edaphic and climatic conditions. The Queensland Nut, Cape Chestnut [*Calodendron capense*] and *Buddleia madagascariensis*, are suitable for positions where smaller trees are required.

Windbreaks should be planted outside the piggery fence, so that the pigs cannot root up the ground and make wallows beneath the trees. Planting in two rows is generally recommended, distance betweeen trees and rows varying according to the species and whether or not they are pruned. As many trees do not give complete shelter down to the ground, it is advisable to plant shrubs as a low hedge on the outside of the windbreak. Some native shrubs can be used for this work, a good species for the lighter coastal soils being *Leptospermum citratum*. Species suggested for the main windbreak are *Callitris cupressiformis* and *C. columellaris* in sandy soils and *Cupressus lusitanica* in heavier soils in the coastal areas with rainfall over 40 in.; *Cupressus arizonica* on the deeper soils. In the Darling Downs area, *Cupressus arizonica*, *C. torulosa*, and *C. lawsoniana* on the lighter, *Pinus longifolia* and *Cinnamomum camphora* on the heavier soils, and *Callitris glauca* on the very light, sandy soils.

Stock of *Callitris cupressiformis*, *Cupressus lusitanica*, *C. arizonica*, and *Grevillea robusta* can be obtained from the Forestry Department

at 35*s*. per 100 in planting tubes. The exotic Pines, 10*s*. per 100, but not in planting tubes.

All trees when planted should be protected from stock; windbreaks should be outside the piggery fence, and shade trees in the piggery should be protected by a strong pig guard. Farmers are advised not to plant White Cedar [*? Thuja occidentalis*] as its fruits are poisonous to pigs.

Wallows on accumulations of damp, dead leaves beneath trees are possible sources of infection by worm parasites, hence it is necessary to allow the morning sun to penetrate beneath shade trees. Trees intelligently used round the piggery can help considerably in the task of keeping pigs healthy and contented.

[1825]. 24.4 (944) : 23.21. POWLES, R. **Tree planting on farms: selection of species.** *Journal of the Soil Conservation Service of N.S.W.* 2 (2; 3), 1946 (155–60; 196–202). H.S.B.

Deals with choice of species for shelterbelts, shade etc., for different regions of New South Wales.

[1826]. 24.4 (775) : 11.62.11. TRENK, F. B. **Influence of planted tree belt in Plainfield sand on erosion control and moisture conservation.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (449–61). 8 refs.

An experimental 8-row shelterbelt composed of conifers and hardwoods was established between 1928 and 1932 on a field of Plainfield sand. Abnormal heat and drought during the first 5 growing seasons caused high mortality in the initial plantings. Coniferous trees (*Pinus strobus*, *P. resinosa*, *P. banksiana*, *Thuja occidentalis*, *Picea abies*) averaged 17 ft. high at 10 years old, and at this height were effective in trapping snow on the adjacent field to the leeward side and protecting soil and crops from the prevailing wind. Cultivation for the first 5 years after planting stimulated tree growth moderately. The application of N benefited hardwoods somewhat, but did not increase the growth rate of conifers. The application of K alone, and K with P, gave only very slightly better growth rates than no treatment. None of the deciduous species did well. *Robinia pseudoacacia* suffered severe borer (*Cyllene robiniae*) damage, suckered vigorously, and at the end of 15 years was removed to prevent damage to other trees in the belt. The important legume hays, red clover and alfalfa, in mixture with grass hay, normally difficult to hold in long rotations on Plainfield sand, survived well where they had the benefit of a continuous blanket of snow deposited in the lee of the shelterbelt.

[1827]. 24.4 (786). **Age affects growth and survival of shelterbelt trees.** *Rep. U.S. Bur. Pl. Ind.* 1945 (13).

In Montana, little or no increase in height is made by *Caragana arborescens* after 20 years, though survival is good and there is little killing back. In 15- and 20-year-old plantings, the survival of Poplar is very low. That of *Acer negundo* is good but in the oldest (29-year-old) plantings die-back is severe. Growth of 29-year-old *Ulmus americana* at close spacing has become stagnant. Growth of *Ulmus pumila* has been fairly steady and die-back generally moderate. Growth and survival of conifers have been good, but some have been killed by the competition of crested wheatgrass. Planting at 4 × 4 ft. spacing results in poor growth and the suppression of many trees. *Caragana arborescens* and *Ulmus pumila* have been highly competitive to *Fraxinus pennsylvanica*, but suppression by *U. pumila* was much less when the two species were separated by 12 ft. Thinning mixed plantings by removing trees in rows adjacent to rows of *F. pennsylvanica* at about 20 years of age, had no beneficial effect on the survival and growth of the Ash during the next 10 years.

[1828]. 24.4 (77) : 78). BATES, C. G. **How shelterbelts benefit crops.** *J. For.* 46 (10), 1948 (767–8).

Measurements made between 1935 and 1941 on more than 300 fields in the Central and Northern Plains, each field protected by a shelterbelt, leave no doubt that shelterbelts result in increased crop yields, which will be more profitable if the belts are kept reasonably narrow. Much depends on the proper placing of field shelterbelts. In this region, where the prevailing winter winds are from the northwest, with strongest winds more northerly than westerly, the greatest benefit is from a belt on the north side of a field, with belts on the west side second, and south side third in effectiveness. Belts on the east side show some benefit, but barely enough to offset the injurious competition close to the trees. If there is no disturbing cross wind, snow is held where it falls on a considerable area south of an east-west

belt, or east of a north-south belt. The crop area benefited may be as wide as 10 tree-heights, or in a strip about 400 ft. wide for an average belt 40 ft. high. Crop benefits to the north of shelterbelts are due partly to drifts forming to windward. Fields on both sides of a belt may benefit, but for the best use of snow it should be blown through the belt and not remain too close to the trees. Tall belts with 3–5 rows of trees permit this, and may show more uniform wind reduction than do the very heavy belts which are preferred for farmstead protection. These results are probably not applicable west of the 100th meridian.

[1829]. 24.4 : 11.12 (945). SIMS, H. J. **The effect of shelterbelt on wind velocity.** *Aust. J. Sci.* 8 (1), 1945 (19–20). O.B.D.

Readings of wind speed at certain distances from a shelterbelt were taken at the Mallee Research Station, Walpeup, Victoria. The shelterbelt was of mixed Pine, Belar [*Casuarina cambagei*], and Mallee [*Eucalyptus*] scrub, the taller trees being up to 30 ft. high. The effect of the shelterbelt in reducing wind velocity extended for a distance of about 6 chains (396 ft.), or about 13 times the height of the belt.

[1830]. 24.4 : 11.62. LAMMERT, W. **Rain shadow.** *Meteorological Magazine* 77 (915), 1948 (206). O.R.S.

On the western edge of a large rectangular garden near Hanover, there is a row of [Lombardy] Poplar trees 35–40 yds. high and 20 yds. broad. Even in the wet summer of 1946, the western part of the garden showed signs of aridity, but in 1947, over the western third, vegetation, including the relatively deeply rooted gooseberry and raspberry bushes, withered away. As the garden is in the middle of a hollow with good subsoil water conditions, these effects could only be attributed to the rain-shadow effect of the Poplars. Readings with rain gauges over the period May 1 to Aug. 31, 1947, at varying distances from the row of trees gave the following results:—

Distance East of Poplars (yds.)	0–5	5–15	15–25	35
Measured rainfall (mm.)	8–33	33–76	76–110	110
Long-period average (mm.).	—	—	—	175

The effect of the trees was enhanced, in the summer of 1948, by the rainfall occurring in the form of showers accompanied by westerly squalls. Visual observations during showers showed that the portion up to 5 yds. from the trees received only drizzle forced through them, with some drippings from the leaves after the shower. The next section, from 5 to 15 yds., received the heaviest drops, while the section from 15 to 25 yds. received a larger quantity and, in winds of force 3–5, the full intensity of the shower. Only beyond 25 yds. was the shower always received at full strength.

24.5. *Pruning*

[1831]. 24.51 : 12.25. PRASAD, J. **Pruning in plantations.** *Indian For.* 74 (1), 1948 (19–29). 15 refs.

After a general account of the purpose and theory of pruning, the author reviews some American, British and Indian literature on the subject and then deals in some detail with small-scale experiments in pruning *Pinus longifolia* at Dehra Dun. [Cf. *For. Abstr.* 5 (256).]

[1832]. 24.51 : 07.7 : 12.25 : 46. **[Pruning of Douglas Fir.]** *Rep. B.C. For. Serv. 1947*, 1948 (20–1).

For earlier reports on this project, see *For. Abstr.* 9 (No. 1579). Index figures based on the area of pruned knots per tree were related to time-cost per pruned foot. It was found that a good estimate of cost can be obtained by sampling the number and size of branches to be pruned. From these measurements an average branch index, indicative of the area of pruned knots per tree, is found and referred to a curve of pruning time. A plantation pruned to 13 ft. in two stages, at 13 and 17 years old respectively, on a good site, took 0·57 minute per foot of pruned length; a similar pruning in one operation on trees at 17 years, took 0·51 minute per foot pruned. Winter pruning resulted in quicker healing than summer, and live pruning than dead. Handsaws once more showed marked superiority to tree pruners or pole saws.

3. FOREST UTILIZATION. FOREST TECHNOLOGY

[1833]. 3 (795) : 07.2. DUNN, P. M. **Forest products research in Oregon.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (341–8).

[1834]. 3 (803) : 07. **Exploitation of forest resources [of Latin America].** *Unasylva* 2 (3), 1948 (112–7).

Includes an outline of how forest products research could be organized and stresses the importance of industrialization to any programme of exploitation.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0. *General Information on Woods*

See also *For. Abstr.* 10 (Nos. 1554, 1565, 1664–5, 1667, 1684, 1705–9, 1714, 2116–7, 2192).

[1835]. 31.0 : 02.1. HOWARD, A. L. **A manual of the timbers of the world, their characteristics and uses.** Macmillan & Co., Ltd., London. 3rd ed., 1948. pp. xxiv + 751. 37 refs.

[1836]. 31.0 (481). KLEM, G. G. En kort orientering om våre skogstrær, deres tekniska egenskaper og utnyttelse. **[A short guide to the forest trees of Norway, [with special reference to] technological properties and utilization [of their woods].]** Grøndahl & Søns Forlag, Oslo. 1947. pp. 53 + 20 plates. [Nor.] Price Kr. 6 (7*s.*).

Deals with all the more important conifers and hardwoods native to, or grown in, Norway, giving for each (in most detail for the conifers) a brief account of its common names (Norwegian, English and German), range in Norway, habitat, characters of the tree, and total growing stock and increment in Norway, followed by rather more detailed information on the macroscopic features, properties and uses of the wood. A key for identifying the woods by macroscopic features is included, and their appearance in radial, tangential and cross sections is illustrated by photographs.

[1837]. 31.0 (54). CHOWDHURY, K. A., and GHOSH, S. S. **Some more commercial timbers of India.** *Indian For. Rec.* (*n.s.*) *Utilization* 4 (3), 1946. pp. ii + 25 + 28 photos. 16 refs.

Describes 28 Indian timbers hitherto not much exploited, giving local names, anatomical characteristics and recommendations for their use.

[1838]. 31.0 (68) : 01.2. **Nomenclature for South African home grown timbers (including natural habitat and weight).** *South Afr. Bur. Stand. Specif.* No. 02, 1947. pp. 19. [E.Afrik.] P.R.

Lists the standard name for each official language, together with other names in common use and the scientific name.

[1839]. 31.0 (88) : 32. LARDNER, G. B. S. **Timbers of British and Dutch Guiana.** *Wood* 13 (10), 1948 (280–2).

A brief account of the timber industry and of the more important timber species of British and Dutch Guiana [cf. *For. Abstr.* 9 (No. 2137)]. In British Guiana the most important timber tree is Greenheart (*Ocotea rodiaei*), which covers about 20,000 sq. miles. It grows on poor soil in a frequency of 1–5 trees per acre, in mixture with Wallaba (*Eperua* sp.) or Mora (*Mora excelsa*), and seldom reaches any great size, the average diameter of logs being 14–24 in. The stems grow straight and clear of branches to a height of 50–60 ft. The rivers of the Greenheart area are navigable for about 50 miles inland and here the forests are being rapidly exhausted. Higher up, where the rivers are broken by a succession of falls, the Greenheart stands are practically inaccessible. Timber is dragged to the waterways by means of winches, teams of natives, or (for long distances) lorries and tractors, and is floated downstream on roughly made punts [cf. *For. Abstr.* 3 (224)]. Greenheart is usually converted by frame saw as the wood is said to lose shape when sawn any other way, but the timber is normally exported in sawn or hewn squares. Greenheart forms about 80% of the exploited timber of British Guiana, but many other species are worthy of attention, e.g. *Eperua* sp., *Mora excelsa*, *Carapa guianensis*, *Simaruba amara* and *Goupia glabra* [cf. *For. Abstr.* 8 (No. 1792) and 9 (No. 1426)]. The timber industry of Dutch Guiana is centred mainly upon Possentrie (*Hura crepitans*). *Virola surinamensis* is

also exported for plywood. *Goupia glabra* is the most widely used local timber. *Eschweilera* sp. and *Dicorynia paraensis* are considered local substitutes for Greenheart, and *Vouacapoua americana* is much used for heavy construction and flooring.

[1840]. 31.0 (881) : 31.28. **75,000 square miles of timber. Commercial possibilities of British Guiana hardwoods as seen by a woodworking machinist.** *Woodwkg. Industr.* 5 (9), 1948 (609–11, 621). P.R.

[1841]. 31.0 : 12.25–9. **Properties of Australian timbers.** *For. Prod. News-Lett. C.S.I.R. Aust.* Nos. 165–6, 1948 (2; 4).

Cypress Pine (*Callitris* spp.), and Karri (*Eucalyptus diversicolor*).

[1842]. 31.0 : 12.25 (73). **American structural woods. IV. Pines.** *Timber News* 56 (2112), 1948 (387).

[1843]. 31.0 : 12.26–8. DESCH, H. E. **The Ashes.** *Wood* 13 (10), 1948 (285–7).

Fraxinus excelsior, Sorbus aucuparia, Eucalyptus regnans, E. fraxinoides, Tarrietia argyrodendron, Flindersia australis, Ehretia acuminata, and *Ailanthus altissima.*

[1844]. 31.0 : 12.26–8. LAMB, G. N. **Foreign woods—origin, use, properties and nomenclature.** *Wood Prod.* 53 (8–10), 1948 (24; 26, 28; 24).

(*a*) Aceituno (*Simaruba glauca*), Baitoa (*Phyllostylon brasiliensis*), Balsa (*Ochroma lagopus*).

(*b*) Boxwood (*Buxus sempervirens*), Blackwood (*Acacia melanoxylon*) and Branna (*Melanoxylon branna*).

(*c*) Campanilla (*Coutarea hexandra*), Ceiba (*Ceiba pentandra*), Caretto (*Ruprechtia* sp.).

[1845]. 31.0 : 12.26–8. **Specimen woods Nos. 153–5.** *Suppl.* to *Wood* 13 (9–11), 1948 (253–4; 283–4; 317–8).

Essia (*Combretodendron africanum*), Ranai (*Alseodaphne semecarpifolia*), and Krabak (*Anisoptera* spp.).

[1846]. 31.0 : 12.26–8 (595). THOMAS, A. V. **Keruing timber.** *Malay. Forester* 11 (4), 1948 (153–6).

Vernacular names, general properties, defects, working qualities, seasoning, durability, mechanical properties and uses of the *Dipterocorpus* spp. included in the name Keruing.

[1847]. 31.0 : 12.26–8 : 12.19 : 21 : 56. KOLLMANN, F. Die Esche und ihr Holz. [**Ash and its wood.**] *Schriftenreihe Eigenschaften und Verwertung der deutschen Nutzhölzer* No. 1, 1941. pp. 147 + plate. 188 refs. [G.] [Mechanisch-technologisch Institut der Reichsanstalt für Holzforschung, Eberswalde.]

A monographic study with particular reference to the wood, under the headings: growth factors; anatomy; chemical properties and molecular structure; enemies, durability, protection, drying and steaming; physical properties; elastic behaviour and strength; uses. In addition, brief introductory chapters deal with: (1) natural occurrence and silviculture, and (2) increment, timber yield and consumption. There are many illustrations.

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 10 (Nos. 1867, 1898).

[1848]. 31.1 : 01.4. KINSINGER, W. G., and HOCK, C. W. **Electron microscopical studies of natural cellulose fibers.** *Industr. Engng. Chem.* 40 (9), 1948 (1711–6). 37 refs. P.R.

Three developments in the technique of preparing specimens for electron microscopy—metallic shadow casting, surface replicas, and electron stains—were applied to a study of the submicroscopic structure of natural cellulose fibres. By metallic shadow casting, fine fibrils whose diameter varied from about 90 to 400 Å., depending on the sample, were demonstrated in beaten natural cellulose fibres (cotton, ramie and wood pulp). Larger fibrils are composed of bundles of these finer units; the existence of these fibrils in unbeaten fibres was confirmed by surface replicas in which contrast had been increased by metallic shadow casting. Periodic variations in structure at about 150 Å. along the long axis of the fibrils were revealed by shadow casting and electron staining. *From authors' summary.*

[1849]. 31.1 : 01.4 : 31.3. NARAYANA NAMBIAR, V. P., and VENKATESWARA RAO, D. (with an introduction by PHILLIPS, E. W. J.). **Identifying timber by light-scattering.** *Timber News* 56 (2111), 1948 (333–5).

A study of the depolarization of the transversely scattered light in saturated extracts with

a few organic solvents of some common woods. The authors claim that this method is very useful for the identification of woods, particularly when specimens are available only in small sizes; but it is suggested in the introduction, which explains in detail the principle of the method, that further research on these elaborate and less orthodox methods of identification would seem justified only where it is important to find some means of separating species which cannot readily be distinguished anatomically. [Cf. *For. Abstr.* 8 (No. 1812).]

[1850]. 31.1 : 12.11.23 : 31.22 : 31.27 : 12.25–9 (54). CHOWDHURY, K. A. **Some aspects of pure and applied wood anatomy.** *Repr.* from *Proceedings of the 35th Indian Science Congress 1948*, 1948 (73–92). 53 refs. X.

A discussion of the importance of wood anatomy to studies of tree growth and in the identification, classification, strength-testing and seasoning of timber.

[1851]. 31.1 : 12.11.23 : 12.11.15 : 56.02. MAŠKOVÁ, J. O letokruzích s hlediska hormonové theorie. **[Annual rings from the point of view of the hormone theory** [: a review].] *Lesn. Práce* 27 (2; 3), 1948 (55–9; 88–99). 38 refs. [Cz.e.]

[1852]. 31.1 : 31.8 : 31.22.2 : 12.25 : 12.26–8 : 12.11.23 : 31.3 : 31.43. **Wood structure.** *Rep. For. Prod. Aust. 1947–8*, 1948 (5–12).

Study of tension-wood fibres of *Eucalyptus regnans* indicates that the secondary wall consists of 3 layers of different micellar orientation: (1) the outer layer in which the micelles lie at 40° to the longitudinal fibre axis, (2) the middle layer in which the angle is 18°, and (3) the unlignified inner (or gelatinous) layer in which it is about 5°. The abnormal properties of tension wood may be related to this cell-wall structure. Experiments in drying fibres isolated from both normal and reaction wood of softwoods showed that the fibres twisted appreciably when dried after transfer from water to alcohol, and from water to alcohol to benzene, and actual longitudinal shrinkage of about 0.5% took place, but the results do not explain the high longitudinal shrinkage observed in reaction wood. The influence of lignification on longitudinal shrinkage in compression wood was investigated by observations on radial longitudinal sections, both before and after controlled delignification, but shrinkage was not reduced by delignification; if anything, it was slightly increased [cf. *For. Abstr.* 9 (No. 2245)].

A correlation has been observed between the presence of tyloses in timber and the type of vessel-ray or vessel-parenchyma pitting. Where pits are larger, tyloses invariably occur in the heartwood. The limit of pit size for the development of tyloses is in the region of 8–10μ. It has also been observed that, wherever tyloses occur, they are formed because a living parenchyma cell borders on an air-filled vessel.

In studies of sapwood and heartwood of Eucalypts, it has become clear that the development of heartwood is connected with the length of life of the ray and vertical parenchyma cells, and their length of life in various species is being investigated. A study of the correlation of heartwood formation with the crown in young *E. regnans*, suggests that all sapwood growth rings in this species are in direct contact with the living leaves. Pruning of *Pinus radiata* causes some increase in heartwood, but the results of experiments were not conclusive.

In investigations of the development of woody cells from the cambium in *Eucalyptus regnans*, tissues differentiated from the cambial zone were found to drop fairly rapidly in moisture content by virtue of secondary thickening. A further drop was noted at the change-over from sapwood to heartwood. It is suggested that, at such a time, a certain amount of gas replaces water in the cell cavities. The cambial zone apparently contains a high % of uronic acid anhydride and a low % of true lignin. A comprehensive study of the growth of *E. gigantea* has been completed; the general characteristics of growth were determined, and a working expression was derived for the estimation of cambial activity at any time of the year. [Cf. *For. Abstr.* 9 (No. 2245).]

An anatomical study has begun of timbers from the south-west Pacific area in order to determine the nature and extent of crystal deposits and certain siliceous inclusions in ray and vertical parenchyma cells. Comparison of sections of *Syncarpia laurifolia* from Hawaii (where it is not resistant to marine-borer attack) and from Australia (where it is resistant) shows that the Australian specimens all had a relatively high SiO_2 content in the form of concretions in the ray cells; the Hawaiian, very

few, if any, such concretions, and very small amounts of SiO_2 altogether. Examination of timbers of known marine-borer resistance from both Australia and New Guinea show abundant siliceous deposits in the ray cells, while non-resistant timbers show none.

[1853]. 31.1 : 01.4 : 34.25 (82). Cozzo, D. Conveniencia de utilizar la sección tangencial en estudios anatómicos de leños medicinales. [**The advantages of using tangential sections in anatomical studies of medicinal woods.**] *Cienc. e Invest., B. Aires* 4 (8), 1948 (345–6). 7 refs. [Span.] A.P.B.

Identification characteristics visible in the longitudinal tangential plane are listed, along with some specific anatomical characteristics of Argentine medicinal woods.

[1854]. 31.1 : 12.25. Yu, C. H. **The wood structure of *Metasequoia disticha, [M. glyptostroboides*].** *Bot. Bull. Acad. sinica* 2 (4), 1948 (227–30). 7 refs.

Cf. *For. Abstr.* 10 (No. 1671).

[1855]. 31.1 : 12.25. Ho, T. H. **Wood anatomy of three species of Pinaceae [*Abies fabri, Picea neoveitchii* and *Tsuga yunnanensis.*]** *Bot. Bull. Acad. sinica* 2 (3), 1948 (198–203). 13 refs.

[1856]. 31.1 : 12.25. Wagg, J. W. B. **The formation of resin canals in Douglas Fir as influenced by environment.** *Abstr.* of thesis, in *J. For.* 46 (10), 1948 (768).

Cf. *For. Abstr.* 10 (No. 503).

[1857]. 31.1 : 12.26–8. Dadswell, H. E., and Ingle, H. D. **Sub-project W.S.1–17. Progress report No. 1. The anatomy of the timbers of the south-west Pacific area. Part I. Anacardiaceae.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1948. pp. 40 + 6 photos, 2 tbls., 1 map. 18 refs. P.R.

The anatomy of a number of species of 22 genera of the family Anacardiaceae has been examined and a summary given for each genus as a whole. Tables giving comparisons of anatomical features of the genera and showing the relationship between botanical classification and anatomical features have been included; it is suggested that a simple card-sorting key may be developed from these. *From authors' summary.*

[1858]. 31.1 : 12.26–8 (9). Dadswell, H. E., and Ingle, H. D. **Sub-project WS. 1–33. Progress report No. 1. The anatomy of the timbers of the south-west Pacific area. Part II. Apocynaceae.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1948. pp. 23 + 5 photos, 1 map, 1 tbl. 20 refs. P.R.

The results reported in this investigation deal with 10 genera of the Apocynaceae (*Alstonia, Cerbera, Dyera, Ervatamia, Hunteria, Kibatalia, Rejoua, Vallaris, Voacanga,* and *Wrightia*) occurring in the south-west Pacific area. The anatomy of a number of species of each genus has been examined and a summary of anatomical features given for the genus as a whole. A table comparing the anatomical features of the genera has been included and an arbitrary key prepared for the separation of the genera examined. *From authors' summary.*

[1859]. 31.1 : 12.26–8. Slatter, E. M. **The wood structure of *Senecio meruensis* Cotton and Blakelock.** *Kew Bull.* No. 1, 1948 (51–3). 3 refs.

[1860]. 31.1 : 12.26–8 (922). Reinders-Gouwentak, C. A. **Key to Lauraceous woods from Java.** *Repr.* from *Meded. LandbHoogesch. Wageningen* No. 49, 1948 (3–12). 11 refs. [E.e.] P.R.

Embodies corrections to the key to Javanese woods by Janssonius. [Cf. *For. Abstr.* 8 (No. 287).]

[1861]. 31.1 : 12.26–8. Chattaway, M. M. **Project W.S. 1–4. Wood anatomy of Australian timbers belonging to the N.O. Proteaceae. Appendix to final report. Note on the vascular tissue in the rays of *Banksia*.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1948. pp. 7 + 14 photos. 2 refs. P.R.

The rays of *Banksia* and *Dryandra* have been found to contain radially aligned vascular tissue. The origin and development of these strands has been followed in species of *Banksia*. Their purpose in the plant's economy is briefly discussed.

[1862]. 31.1 : 12.26–8. Frison, E. De la structure microscopique du bois de l'*Avicennia africana* P. Beauv. [**The microscopic structure of the wood of *Avicennia africana* P. Beauv.**] *Bull. agric. Congo belge* 39 (3), 1948 (587–92). [F.]

[1863]. 31.1 : 12.26–8. REINDERS-GOUWENTAK, C. A., and STAHEL, G. **Wood anatomy and systematic position of *Ropourea guianensis* Aubl.** *Repr.* from *Meded. LandbHoogesch. Wageningen* No. 49, 1948 (19–24). 20 refs. [E.e.] P.R.

31.2. *Physical Properties*

See also *For. Abstr.* 10 (No. 1850).

31.21. Colour and Lustre. Conductivity

See also *For. Abstr.* 10 (No. 1998).

[1864]. 31.21.1. MOON, P., and SPENCER, D. E. **The color of unstained wood.** *Repr.* from *Journal of the Optical Society of America* 38 (4), 1948 (405–8). 14 refs. P.R.

Reflectances and colours are given for 35 natural woods. The results are summarized in a table, which gives the coefficients for empirical equations that fit all the spectral reflectance curves, and a second table giving integrated values obtained by the analytic method. Clear varnish is found to reduce reflectance to approximately 85% of that for the unvarnished wood. *From authors' summary.*

[1865]. 31.21.4 : 33.15. THUNELL, B. Något om temperaturfördeling i skivor av trä vid varmpressning. **[On the distribution of temperature in wooden plates during hot pressing.]** *Svensk PappTidn.* 50 (11*b*), 1947 (167–9). [Sw.] [Svenska Träforskningsinstitut, Stockholm.] D.S.I.R.

Describes briefly a mathematical method of calculating the temperature distribution in a thin piece of wood pressed between hot plates, and expresses the results obtained in the form of graphs, relating the thickness of the wood to the rise in temperature and to the conductivity of the wood.

31.22. Relation to Water, Air, Gases

See also *For. Abstr.* 10 (No. 1852).

[1866]. 31.22.1 : 07.7. RIETZ, R. C. **Moisture meters reliable in inspection studies.** *Repr.* from *Wood, Chicago,* February, 1947 [1948?] (26, 42). P.R.

Moisture tests were carried out on kiln-dried Oak to be used for flooring, by the standard method of cutting moisture sections and by the use of a resistance-type electric moisture meter. The results obtained from the 2 methods are given in graphs, and show an average moisture content of 7·76% as determined by the meter and 7·20% from the moisture sections. This difference of 0·56%, while statistically significant, is considered of little practical importance. The graph shows that 70% of the measurements taken with the meter were below 8% moisture content as against 80% of the moisture-section measurements. Up to about 9·5% moisture content the curves run at a distance of approximately 1% difference and would superimpose if the meter had read consistently 1% lower.

[1867]. 31.22.3 : 31.1. **Diffusion studies.** *Rep. For. Prod. Aust. 1947–8,* 1948 (41).

In transverse diffusion of salts in wood, the ray cell area is the most important structural feature. This may account for the significant difference in diffusion rates in the radial and tangential directions. Transverse diffusion rates seem to be correlated with direction and distribution of vessels rather than with total vessel area. [Cf. *For. Abstr.* 9 (No. 2422).]

31.23. Weight. Specific Gravity

See also *For. Abstr.* 10 (Nos. 1873–4).

[1868]. 31.23 : 12.25 : 31.22.1. **[Specific gravity of exotic coniferous timbers in New Zealand.]** *Rep. N.Z. For. Serv. 1947–8,* 1948 (47–8).

Specific-gravity tests were made on several trees of different exotic species from the arboretum at Whakerewarewa. Comparable tests on timber grown in adjacent areas under forest conditions showed that the specific gravity mean for arboretum and forest material was almost the same in the 2 sets but in arboretum material the range for specific gravity showed greater extremes. In general, the higher specific gravities occur at the base with maxima in the central core, and the lower specific gravities near the top of the trees, with minima at the central core. The occurrence of a specific-gravity mean and specific-gravity pattern, which are similar in trees of approximately the same age grown under considerably different environmental but similar climatic conditions, further indicates that, in the species investigated, specific gravity is a function of age

rather than rate of growth. [Cf. *For. Abstr.* 9 (No. 920).]

Specific-gravity figures (mean values, weight oven-dry, volume green) for the arboretum material are compared with those for the forest-grown material (in parenthesis) as follows:—

Pseudotsuga taxifolia .	0·44	(0·45)
Pinus taeda . .	0·34	(0·33)
P. patula . . .	0·36	(0·35)

The Douglas Fir and Loblolly Pine figures are comparable, the trees being respectively 40 and 30 years old in each case. The *P. patula* tests were not directly comparable owing to a difference of 7 years in age.

In another test, 250 samples of *P. radiata* from dominant, co-dominant, and suppressed trees, were cut and tested. The available specific-gravity results from this material (22–23 years old) give a basic specific gravity mean of 0·351. Following this work, there has been a re-investigation of the moisture content of *P. radiata* by zones from the pith to the bark. This has confirmed the results of a former small study, namely that the heartwood possesses a moisture content of 40–50%, which extends usually 1–2 rings outside the visual heartwood boundary into a dry zone [cf. *For. Abstr.* 10 (No. 1902)], then rises sharply to a maximum moisture content of about 200% and decreases only very slowly towards the bark. The moisture content determined by the Dean and Stark water-estimation spirit method indicated that moisture-content determination by oven drying may, in the case of resinous heartwood, lead to significant errors.

31.27. Mechanical Strength

See also *For. Abstr.* 10 (Nos. 1923–4, 1999–2001, 2104, 2120, 2138, 2191, 2199, 2205).

[1869]. 31.27 : 33.15.2. HEARMON, R. F. S. **The elasticity of wood and plywood.** *Spec. Rep. For. Prod. Res., Lond.* No. 7, 1948. pp. i + 87. 140 refs. Price 2*s*.

The report is divided into 3 sections: (1) The elastic constants of wood, covering historical and general aspects, methods for measuring the elastic constants, the effects of frequency, temperature and moisture content, the mathematical theory of wood elasticity, the effects of grain angle and of coupling between shear and extension, problems of stress distribution, and internal damping and creep; (2) the elasticity of plywood, covering the elastic constants of plywood, and stress/strain relationships in plywood; and (3) the properties of plywood plates and cylinders, covering the elastic theory of plywood plates, numerical calculation of the flexural and torsional rigidities D_{ik}, the buckling of plywood plates, the frequency vibration of 0° and 90° plates, the central deflection of 0° and 90° plates under lateral loading, and the buckling of plywood cylinders. There are numerous diagrams, graphs and tables.

[1870]. 31.27 : 07.2 : 01.4 : 33.15.2. LEWIS, W. C. **Fatigue of wood and glued-wood constructions.** *Proc. Amer. Soc. Test. Mater. 1946*, 1947 (814–32). 7 refs .P.R.

This paper summarizes the experience in the fatigue testing of wood and glued-wood constructions at the Forest Products Laboratory [Madison]. Methods are presented which have been developed for making tests of wood in cantilever bending, in tension parallel or perpendicular to the grain for solid or glued specimens, and on glued laminated specimens in which the glue joints are stressed in shear.

The endurance limit for wood and glued-wood constructions is not indicated by tests that have continued to 30,000,000 cycles in direct-stress tests and to 50,000,000 cycles in cantilever-bending tests; thus, the results of fatigue tests of wood are reviewed in terms of endurance load for specified numbers of cycles rather than for any estimated endurance limits. Unlike the failures of some other materials, failures resulting from fatigue of wood are of the same character and appearance as those developed in static tests. *Author's summary.*

[1871]. 31.27 : 33.4 : 31.22.1. **Timber physics. Studies of creep in wood.** *Rep. For. Prod. Aust. 1947–8*, 1948 (21–3).

Tests on prolonged loading of initially green beams have continued [cf. *For. Abstr.* 9 (No. 2261)]. Two which were loaded to a maximum stress of approximately 45% of the ultimate strength as determined in standard tests, and one loaded to just over 20%, have failed. Two initially air-dry beams, loaded at stresses of a little over 40% of the short-time ultimate strength, failed in 24 and 77 days. Total deflection of initially air-dry beams after 5 months under load was about twice the original value, whereas in initially green beams, under the same stresses, the deflection increased about

fourfold. No variations in stiffness, as determined by vibration methods, was seen in initially green beams under load for well over a year. Beams loaded to extreme fibre stresses of 3–6% of ultimate strength showed an increase in deflection in 9 months of about 210%. In 2 months, beams loaded to the lower stress recovered by 13% of the total time increment, and those loaded to the higher stress by 39%. Preliminary tests on creep in specimens under tension have given rather variable results.

[1872]. 31.27 : 12.25 (943). KINGSTON, R. S. T. **Project T.M. 9–7. The mechanical properties of Queensland grown Hoop Pine. Final report.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1947. pp. 48 + 2 photos, 22 gphs, 11 tbls., 1 map. 42 refs. P.R.

The results of tests of clear specimens of Queensland Hoop Pine (*Araucaria cunninghamii*) show that it ranks high among softwoods in regard to mechanical properties other than dry impact strength tangential to the grain, in which it is comparatively low. It is a brittle species, and gives little warning of failure. Its properties in general fall off slightly as the pith is approached. The correlation between mechanical properties and density is not sufficiently high for a reliable estimation of the properties of an individual piece to be made from its density. Permissible design stresses and curves of allowable stresses in columns are presented. *From author's summary.*

[1873]. 31.27 : 12.26–8 (595). THOMAS, A. V. **Allowable working stresses for Malayan timbers.** *Malay. Forester* 11 (4), 1948 (157 + tbl.).

Gives average air-dry weight, modulus of elasticity, strength in bending, in compression parallel to and perpendicular to the grain and shear along the grain, in dry places under cover, outside but not in contact with the ground, and in wet places, for *Shorea* spp., *Madhuca utilis*, *Balanocarpus heimii*, *Hopea nutans*, *Dipterocarpus* spp. *Vatica* spp. *Koompassia malaccensis*, *Intsia palembanica*, *Dryobalanops aromatica*, *D. oblongifolia*, *Tarrietia simplicifolia*, *Scorodocarpus borneensis*, *Parashorea lucida*, *Tetramerista glabra*, *Anisoptera* spp. and *Cratoxylon arborescens*.

[1874]. 31.27 : 12.26–8 (595) : 31.23. **[Strength/weight ratio of some Malayan timbers.]** *Malay. Forester* 11 (4), 1948 (139–40).

Includes a table showing strength/weight ratio of several species of *Dipterocarpus*, *Dryobalanops*, *Balanocarpus* and *Shorea* with corresponding values of the principal temperate-zone softwoods for purposes of comparison. The table shows that the Malayan timbers, including very heavy species such as *Balanocarpus heimii* and the less heavy *Shorea* spp., have a better strength/weight ratio in both bending and compression than softwoods such as Spruce (Red, Black and Sitka) and Scots Pine.

31.28. Working Qualities

[1875]. 31.28. HYLER, J. E. **Working qualities of lumber.** *Sth. Lumberm.* 177 (2217), 1948 (42).

Wood properties necessary for good performance in sawing, bending, moulding, sanding and similar operations are discussed and species that give particularly good or bad results are instanced.

[1876]. 31.28 : 12.26–8. **[Working qualities of *Parinari excelsa*.]** *Rep. For. Dep. Uganda 1947*, 1948 (18).

Preliminary reports on pilot tests state that the timber of *Parinari excelsa* was irregular and slightly interlocked in grain, with an average weight of 52 lb./cu. ft. at 12% moisture content. It offered a moderate resistance to cutting by machine tools when they were sharp but had a very severe dulling effect upon their cutting edges, particularly in the case of planer knives. A ripsaw having 40 teeth with 15° hook was blunt after it had cut 4 ft. of 3-in. material, and the teeth of crosscut saws and bandsaws were also rapidly blunted. The dulling effect of the timber was not so severe during the conversion of the logs, owing to the higher moisture content (80–100%), but the output per saw was very limited. In planing, the timber showed a tendency to tear out, but in general it finished cleanly though cutting edges were quickly blunted.

31.3. *Chemical Properties*

See also *For. Abstr.* 10
(Nos. 1580, 1849, 1852, 1908–12, 2034, 2049, 2052, 2056–7, 2185).

[1877]. 31.3. MARK, H. **Recent progress in the chemistry of wood.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O.*]

Subcommittee on Wood Chemistry, Geneva 1948 (7–8). [Polymer Research Institute, Polytechnic Institute of Brooklyn, U.S.A.] P.R.

A brief survey of recent developments in cellulose chemistry, lignin chemistry and new practical uses of wood constituents.

[1878]. 31.3 : 12.25–8 (94). **Wood chemistry.** *Rep. For. Prod. Aust. 1947–8*, 1948 (13–8).

Chemical investigations of Australian woods and isolated lignins by subjecting them to nitrobenzene oxidation and separating the resulting aldehydes by means of vacuum sublimation, showed that the molar ratio of syringaldehyde to vanillin for Eucalypts of the 'Ash' group was 4 : 1, whereas for *Eucalyptus marginata* it was only 1·5 : 1. The aldehyde from the oxidation of *Pinus radiata* was mainly vanillin, and *Araucaria cunninghamii* and *Phyllocladus rhomboidalis* yielded only vanillin on sublimation. Klason lignin, wood-hydrolysis lignin, kraft lignin and soda lignin all yielded 5% or less of aldehyde when subjected to alkaline nitrobenzene oxidation, but methanol lignin from *E. regnans* yielded 26%. This is taken as further evidence that methanol lignin is closer to native lignin than any of the other four. The fractionation of methanol lignin into aldehydes, acids and phenols was attempted by extraction of its solution in chloroform with $NaHSO_3$, Na_2CO_3 and NaOH respectively. Although there was an appreciable yield of aldehydes, the bulk of the lignin was retained in the phenol fraction, the yield of acids being negligible. A similar separation was effected by precipitating the concentrated methanol extract of wood into $NaHSO_3$ solution. Both cryoscopic and viscometric methods were used in attempts to find the molecular weight of the phenolic fraction of methanol lignin, and it was concluded that this lignin is not a high polymer. When wood of *E. regnans* was previously deacetylated the usual course of methanol extraction was not completely inhibited, but a smaller yield of a more degraded product was obtained. [Cf. *For. Abstr.* 9 (No. 2268).]

Further investigations into the breakdown of holocellulose, when treated with dilute alkali, indicate that the easily hydrolysable links are peculiar to wood cellulose [cf. *For. Abstr.* 9 (No. 2268)]. Experiments were also undertaken in the fractionation of wood and holocellulose nitrates. The molecular weight of each fraction was determined and the molecular-weight frequency-distribution curves so derived have been interpreted as being the result of an acid hydrolysis at a periodic acid-sensitive weak link. The hypothesis is being checked. Wood of *Eucalyptus regnans* exhaustively extracted with methanol at 150° C. yielded, on extraction with hot water, at least 5% of a polyuronide material, which has been separated, on the basis of solubility, into 2 chemically similar fractions. Extraction of wood of the same species with 5% NaOH at room temperature yielded 4 crude fractions. The weight of hemicellulose recovered corresponded to about 53% of the weight lost by the wood during the alkali extraction.

Chemical investigation of young sapwood, sapwood, heartwood, inner bark and outer bark of young *Eucalyptus regnans* felled after the renewal of spring growth, gave preliminary results as follows:—(1) during uronic-acid determinations the phloem elements and the cambium evolve greater amounts of CO_2 than the xylem elements; (2) the phloem elements and the cambium contain greater amounts of free acids, soluble in 80% ethanol; (3) lignin contents, determined indirectly, are about 1% for the cambium zone, 11% for the outer bark, 24% for the heartwood; (4) about 10–15% of sucrose is present in the dry cambium material.

In comparing the removal of pentosan and uronic-acid constituents of immature *Eucalyptus regnans* by dilute H_2SO_4, it was evident that the former is removed at a faster rate during the initial stages of hydrolysis. An estimation of the amount of non-accessible pentosan was made. During attempts to characterize the simple carbohydrates resulting from the hydrolysis of wood hemicelluloses, the Ba salt of what appears to be xylono-methylaldobionic acid was isolated.

[1879]. 31.3 : 33.3 : 34.6. SCHÜTZ, F., SARTEN, P., and MEYER, H. Beiträge zur Holzchemie, III. **[Contributions to wood chemistry, III.]** *Holzforschung, Berlin* 1 (1), 1947 (2–20). 16 refs. [G.]

[Cf. *For. Abstr.* 6 (168); 8 (Nos. 1840–1).] Experiments are described which show that the lignin and cellulose obtained from wood are secondary products not present in wood in the form in which they are isolated from it. (1) The quantity of lignin obtained by steam extraction from wood plus the 'excess lignin'

obtained from the wood residue after extraction, was considerably larger than that determined as present in the original wood. Tabulated results of the lignin isolated from Birch and Beech show that the quantity of excess lignin varies with the method and conditions of the experiment. (2) Results of experiments to determine the analytical content of Lilac shoots a few days old, by treatment with cold concentrated acids, by extraction with steam and with methanol, and by alkali fusion are tabulated and show a surprisingly close correspondence with that of wood. (3) Artificial lignin produced by 4 methods had in 2 cases a close resemblance to deciduous and in the other 2 to coniferous lignin. (4) Addition of sugars to straw and of phenols to Beech wood gave considerably increased lignin yield. (5) Wood, α-cellulose and unbleached pulp were treated with H_2O_2 and steam alternately. The wood was almost completely (92–8%) dissolved by the treatment, while the α-cellulose and pulp were only 3 and 18% dissolved respectively.

[1880]. 31.3 : 07.2 (431–5) : 33.3 : 34.6. FARBER, E. **Recent German work on lignin.** *Bull. Ntheast Wood Utiliz. Coun.* No. 19, 1948 (35–54). 71 refs. T.D.A.

A review, with bibliography, of developments in lignin research, covering the chemical nature of lignin and its utilization in Germany during and just before the war.

[1881]. 31.3. BRAUNS, F. E. **The proven chemistry of lignin** [: **a review**]. *Bull. Ntheast. Wood Utiliz. Coun.* No. 19, 1948 (7–34). T.D.A.

[1882]. 31.3 : 33.32 : 34.6. WACEK, A. VON. **The nature of lignin and its utilization.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O.*] *Subcommittee on Wood Chemistry, Geneva* 1948 (12–3). [Division of Organic Wood Chemistry, Chemical Institute, Vienna.] P.R.

[1883]. 31.3 : 34.6 : 33.3. RUSSELL, A. **Interpretation of lignin. I. The synthesis of gymnosperm lignin.** *J. Amer. chem. Soc.* 70 (3), 1948 (1060–4). 5 refs. O.R.S.

[1884]. 31.3. BAILEY, A. **The lignin-alcohol condensation—the reaction of lignin with amino-and nitro-butanol.** *Paper Ind.* 29 (11), 1948 (1606–7, 1611). 8 refs. L.S.

Samples of *Tsuga heterophylla*, *Populus tremuloides* and *Pinus banksiana* were digested with amino- and with nitro-butanol solutions having different pH values, and the reaction products examined and tested for N content. Results obtained indicate that butanol reacts with lignin in a manner similar to other alcohols, the alcohol condensing with the lignin.

[1885]. 31.3 : 12.25. HOLMBERG, B. Ligninuntersuchungen xviii. Die Alkoholyseprodukte des Fichtenholzes. [**Lignin research XVIII. Alcoholysis products of Spruce wood.**] *Svensk PappTidn.* 50 (11*b*), 1947 (111–6). 9 refs. [G.] [Kungl. Vetenskapsakademiens Nobelinstitut, Frescati, Stockholm.] D.S.I.R.

[1886]. 31.3. AULIN-ERDTMAN, G., BJÖRKMAN, A., ERDTMAN, H., and HÄGGLUND, S. E. Einige Überlegungen und Modellversuche zur Sulfitierung des Lignins. [**Observations and small-scale experiments on the sulphonation of lignin.**] *Svensk PappTidn.* 50 (11*b*), 1947 (81–5). 18 refs. [G.] [Kungl. Tekniska Hogskolan, Stockholm.] D.S.I.R.

[1887]. 31.3 : 33.32.1. HEDLUND, I. Über die Ligninkondensation beim Sulfitkochprocess. [**The condensation of lignin in the sulphite pulp process.**] *Svensk PappTidn.* 40 (11*b*), 1947 (109–10). 1 ref. [G.] D.S.I.R.

Concludes from experiments, the results of which are expressed in graphs and tables, that lignin which is not yet sulphonated during acid catalysis condenses more easily than lignin which is partly sulphonated, but that undissolved, slightly sulphonated lignin acts as a catalyser in the condensation process.

[1888]. 31.3 : 33.32.1. LANGE, P. W. **Some views on the lignin in the wood fiber during the sulfite cook.** *Svensk PappTidn.* 50 (11*b*), 1947 (130–4). 7 refs. [E.] [Svenska Träforskningsinstitut, Stockholm.] D.S.I.R.

Samples of Spruce were subjected to sulphite cooking and were removed and examined (by photoelectric and photographic-photometric methods) at different periods. Photographs of the fibres at various stages are presented. Conclusions were: (1) that the sulphonation of the lignin has little radical effect on its structure; and (2) that the lignin in the middle lamella is attacked at a very early stage in the cook and that, in the neighbourhood of the

defibration point, the orientation of the lignin is reduced to complete disorder. Further investigations of the fibre-binding material (lignin and non-lignin) is planned.

[1889]. 31.3 : 34.6 : 33.3 : 12.25. ABREHAMSON, B., LINDGREN, B. O., and HÄGGLUND, E. Über die Sulfitierung des Fichtenlignins. **[On the sulphonation of Spruce lignin.]** *Svensk PappTidn.* 51 (20), 1948 (471–4). 3 refs. [G.sw.e.] P.R.

When Spruce wood is heated in a solution of $NaHSO_3/Na_2SO_3$ (pH about 5), about $\frac{1}{3}$ of the total lignin is dissolved. In the wood residue, the ratio OCH_3/S is 2·71, in the lignosulphonic acid in solution, 2. The lignosulphonic acid can be further sulphonated to a ratio of $OCH_3/S = 1$ by heating in an acid solution at pH = 1–2. During this second sulphonation a carbohydrate component is removed from the lignosulphonic acid. This sulphonation does not change the ultra-violet absorption of the substance, which is in accordance with previous results and shows that sulphonation is not accompanied by a deep-seated change in the structure of the lignin. *From authors' summary.*

[1890]. 31.3 : 34.6 : 33.32.1. SAMUELSON, O., and WESTLIN, A. Beitrag zur Chemie der Sulfitkochung. **[A contribution to the chemistry of the sulphite process.]** *Svensk PappTidn.* 50 (11*b*), 1947 (149–54). 19 refs. 51 (8), 1948 (179–85). 9 refs. [G.E.g.sw.] D.S.I.R.

Experiments showed that the amounts of thiosulphate and polythionate in sulphite waste liquors were small. The S contents of high molecular sulphonic acids were higher than expected from the neutralization curves. Ba salts of the lignosulphonic acid proved to contain no elementary S, thiosulphate or polythionate; thiosulphate was formed when an alkaline solution of the preparation was heated at 150° C. When a lignosulphonic acid solution was heated with or without the additions of S, thiosulphate and H_2S, it reacted with them, forming either water-soluble or insoluble compounds according to the experimental conditions. Sulphonic acid groups were split off. *From authors' summary.*

[1891]. 31.3 : 34.6 : 33.32.1. ADLER, E. Uber die 'lose gebundene' schweflige Säure der Sulfitablauge. II. Zur chemischen Natur der SO_2-bindenden Substanzen. **[The 'loosely combined' sulphurous acid of sulphite liquor: II. On the chemical nature of the substances which combine with SO_2.]** *Svensk PappTidn.* 50 (11*b*), 1947 (9–16). 26 refs. [G.] [Svenska Träforskningsinstitut, Stockholm.] D.S.I.R.

Reviews previous work on the subject and describes, with graphs and tables, the results of experiments to ascertain the nature of the substances in sulphite waste liquors which combine with H_2SO_3. Among the substances examined, the volatile aldehydes (especially formaldehyde and methylglyoxal) and the lignosulphonic acids are found to play a major part. Waste liquors from rayon pulp cooks and hard cooks differ: in the first, H_2SO_3 combines mainly with volatile aldehydes, in the second with non-volatile CO compounds.

[1892]. 31.3 : 33.32.1 : 12.25. BRYDE, Ö., and RÅNBY, B. **The molecular weight and other properties of native wood cellulose.** *Svensk PappTidn.* 50 (11*b*), 1947 (35–44). 33 refs. [E.e.] D.S.I.R.

Sulphite cooking experiments were carried out with Spruce (*Picea abies*) to provide material suitable for an investigation of the molecular properties of the native wood cellulose. The material was nitrated and acetone solutions of the resulting samples were investigated by measurements of viscosity, sedimentation and diffusion. A few osmotic measurements were also taken. The different estimates of molecular weight calculated from these measurements are discussed. It is shown that the substance is very heterogeneous, and that a single figure cannot give a satisfactory expression for the chain-length characteristics. *From authors' summary.*

[1893]. 31.3 : 12.11.11. PIGMAN, W. W., and GOEPP, R. M. **Chemistry of the carbohydrates.** Academic Press, Inc., New York 10. 1948. pp. 748. Many refs. P.R.

[1894]. 31.3 : 12.11.11. MCILROY, R. J. **The chemistry of the polysaccharides.** Edward Arnold & Co., London. 1948. pp. 118. 311 refs. Price: 10*s.* 6*d.* P.R.

[1895]. 31.3 : 12.25. CAMPBELL, W. G., HIRST, E. L., and JONES, J. K. N. **The ε-galactan of Larch woods (*Larix decidua*).** *Journal of The Chemical Society* June, 1948 (774–7). O.R.S.

The structure of the ϵ-galactan of European Larch wood has been investigated. It is shown that the methylated derivative is a mixture, one portion of which contains at the most only a trace of pentosan, whilst the other is rich in pentosan. The methylated derivative of the pentosan-free portion gave on hydrolysis 2:3:4:6-tetramethyl galactose, 2:3:4-trimethyl galactose, and 2:4-dimethyl galactose in equimolecular proportions. The structural significance of these results is discussed. By graded hydrolysis the pentose residues were removed from the crude ϵ-galactan, and on hydrolysis of the methylated degraded polysaccharide, 2:4:6-trimethyl galactose was obtained in addition to the 3 sugars mentioned above. It is concluded that ϵ-galactan is a mixture of polysaccharides, one of which is a galactan and the other a galacto-araban. *Authors' summary.*

[1896]. 31.3 : 12.25 : 33.39 : 31.8 : 33.32.1 : 34.6. STOCKMAN, L., and HÄGGLUND, E. Om granvedens träpolyoser och deras förhållande vid hydrolys. [**The wood polyoses of Spruce and their reaction to hydrolysis.**] *Svensk PappTidn.* 51 (12), 1948 (269–70, 271–2, 273–4). 18 refs. [Sw.g.e.] P.R.

The polyoses were isolated from normal and compression wood of Spruce (*Picea abies*) by successive stages of hydrolysis, and a quantitative determination was made of the sugars present in different kinds of sulphite waste liquor. The results are tabulated. The following points are considered of particular interest: (1) there is little or no glucan in easily hydrolysable polyoses, but a large amount in those which are hard to hydrolyse; (2) araban, constituting 0·5–1% of the wood by weight, is the most readily hydrolysed of the polysaccharides; (3) about half the sugar content of sulphite waste liquor of various kinds is mannose; glucose has been found with certainty only in rayon waste liquors; (4) compression wood may contain as much as 10% galactan as opposed to about 2% in normal wood. *From authors' summary.*

[1897]. 31.3 : 12.26–8. WISE, L. E., RATCLIFF, E. K., and BROWNING, B. L. **Determination of mannose. Mannans in hardwoods.** *Analyt. Chem.* 20 (9), 1948 (825–8). 25 refs. P.R.

The Hagglund-Bratt method for the determination of mannose and mannans in wood was modified and applied to 4 hardwoods (Oregon Maple [*Acer macrophyllum*], Aspen [*Populus tremuloides*], Red Alder [*Alnus rubra*] and Quebracho Colorado [*Schinopsis* sp.]) all of which proved to contain small amounts of mannan. In at least one case (Aspen), mannose units were shown to be present in hardwood α-cellulose. Cotton linters, on hydrolysis, gave no mannose. The results are tabulated. *From authors' summary.*

[1898]. 31.3 : 31.1 : 12.26–8. WATSON, A. J. **Colour reactions of wood. Progress report No. 1. Experiment C.6–4–Y–1. Preliminary examination of the material in the truewood of *Eucalyptus oblíqua* L'Hérit. and *E. bicolor* A. Cunn. which gives a colour reaction with sodium nitrite.** Div. For. Prod., Comm. sci. indust. Res., Aust. 1948. pp. 9. 2 refs. P.R.

[1899]. 31.3 : 12.25 : 31.42.11. RENNERFELT, E. **Investigations of thujaplicin, a fungicidal substance in the heartwood of *Thuja plicata* D. Don.** *Physiol. Plant., Copenhagen* 1 (3), 1948 (245–54). 12 refs. [E.e.]

Tests were made of the fungicidal properties of α-, β-, and γ-thujaplicin, 3 isomeric compounds isolated from the heartwood of *Thuja plicata* [cf. *For. Abstr.* 10 (No. 294)]. Decay fungi are inhibited in concentrations between 0·001 and 0·002% of γ-thujaplicin (10–20 p.p.m.). Phenol, tested in the same way, inhibits the decay fungi in 0·1–0·2% concentrations. Bluing fungi are completely inhibited in a solution of 0·01–0·02% and still considerably inhibited in a solution of 0·002–0·005% γ-thujaplicin. The growth of the bluing fungi ceased in agar containing 0·1% phenol. Of the isomeric compounds tested according to the agar diffusion method, β-thujaplicin is most toxic, and γ-thujaplicin is somewhat more toxic than α-thujaplicin. On the whole, thujaplicin is about as active as Na pentachlorophenol. *From author's summary.*

[1900]. 31.3 : 12.25. KURTH, E. F., and LACKEY, H. B. **The constituents of Sierra Juniper wood (*Juniperus occidentalis.* Hooker).** *J. Amer. chem. Soc.* 70 (6), 1948 (2206–9). 4 refs. O.R.S.

The ethyl-ether-soluble content of Sierra Juniper wood was found to range between 2·96 and 6·5%. Approximately an additional 1% of material, chiefly a catechol phlobaphene,

is soluble in acetone. A part of the ethyl-ether extractive is soluble in petroleum ether. This amounted to 2·53% on the weight of sapwood and 3·01% on the weight of the whole wood from a cross-section of the trunk. A detailed analysis of the petroleum-ether solubles is tabulated.

The constituents of the petroleum-ether extract were resin acids, oleic acid and high-molecular-weight lactonic acids, a mixture of α and β sitosterol and a hydroxy resene, $C_{18}H_{31}O$. The resin acids occurred only in the free state.

The volatile oil from the trunk of the tree ranged from 0·9 to 1·25% and was apparently entirely cedrol. That from the rootwood was a mixture of cedrene and cedrol. *From authors' summary.*

[1901]. 31.3 : 12.25. HAYWARD, F. W., and SEYMOUR, R. B. **Determination of major constituents of Cedar oil vapor in Cedar chests.** *Analyt. Chem.* 20 (6), 1948 (572–4). 7 refs. P.R.

A procedure is given for rapid colorimetric determination of cedrene and cedrol in Cedar (*Juniperus virginiana*) chests. The method is based on a red-violet colour formation resulting from the reaction of cedrene with vanillin in the presence of HCl. The cedrol is then dehydrated to cedrene with phosphoric acid and determined as above. *From authors' summary.*

[1902]. 31.3 : 12.25 : 34.26 : 21.8. **[Resin content of *Pinus radiata*.]** *Rep. N.Z. For. Serv. 1947–8*, 1948 (50).

Investigations were made of seasonal variation in resin content, and zonal resin content from pith to bark at several levels, in 5-year-old *Pinus radiata*. Outside the true heartwood, the resin content of which was as high as 35% in one instance but was usually 6–13%, there is a dry zone, apparently intermediate in character and resin content, between the heartwood and sapwood [cf. *For. Abstr.* 9 (No. 1024; 10 (No. 1868)]. In the sapwood there is generally a consistent decrease in resin content towards the bark. Summer fellings show higher sapwood resin contents towards the top of the tree than do spring fellings, but in few instances do they exceed 2%.

[1903]. 31.3 : 12.25. BERGSTRÖM, H., and TROBECK, K. G. Glycerin ur tall, gran och töre. **[Glycerol from Pine, Spruce and resinous wood.]** *IVA, Stockholm* No. 2, 1945 (52–6). 2 refs. [Sw.] L.S.

Wood chips were extracted with petroleum ether and the amount of glycerol present determined. Amounts were: Scots Pine (sapwood) 0·60–5% of the extracted matter; (heartwood) 0·14%; Norway Spruce 0·52%; and resinous wood 0·07%. Fatty acids ranged from 28·3% for Spruce to 60·2% for Pine sapwood. Experiments with sulphate cellulose liquor showed that glycerol was present in only a very dilute form.

[1904]. 31.3 : 12.11.23. BERTRAND, G., and SILBERSTEIN, L. Variation du méthanol du bois avec l'âge. **[Variations in the methanol content of wood with age.]** *C.R. Acad. Agric. Fr.* 32, 1946 (785–6). [F.] E.M.B.

Wood of different ages from *Picea abies*, *Pinus pinaster*, *Fagus sylvatica* and *Quercus sessiliflora* was analysed for methanol content in the same way as for acetic acid. [Cf. *For. Abstr.* 8 (No. 1832).] Results are tabulated. They show clearly that the hydrolysable methanol content of wood diminishes with age. This decrease is even more marked than with acetic acid.

31.4. *Durability. Decomposition*

See also *For. Abstr.* 10 (No. 1986).

31.42. Attack by Plant Organisms

See also *For. Abstr.* 10
(Nos. 1899, 1952, 2045–7, 2078).

[1905]. 31.42.11 : 31.3 : 31.27 : 44.3. LOHWAG, K. Pilze als Feinde unseres Holzes. **[Fungi as enemies of our timbers.]** *Veröffentlichungen der österreichischen mykologischen Gesellschaft* No. 1, 1948. pp. 21. 16 refs. [G.] P.R.

[1906]. 31.42.11 : 12.21 : 07.2 : 01.4 : 44.3. NOBLES, M. K. **Studies in forest pathology. VI. Identification of cultures of wood-rotting fungi.** *Canad. J. Res.* 26C (3), 1948 (281–431). 153 refs. P.R.

A numerical key is presented for the identification of cultures of 126 species of wood-rotting fungi, with accompanying descriptions of the culture characteristics of each species. The list of species includes many of the fungi most frequently encountered in studies of decay in various hosts, the species having been

chosen without restriction as to host or locality. The descriptions and key have been based on characters in culture, both macro- and microscopic, that can be demonstrated readily without the aid of elaborate equipment or methods. Host relationships and physiological and morphological characters proved to be of diagnostic value. The numerical key will permit the interpolation of additional species as they are described and their code numbers prepared. The article is illustrated with photographs and drawings. *From author's summary.*

[1907]. 31.42.11 : 07.2 : 01.4. PRESTON, A., and MCLENNAN, E. I. **The use of dyes in culture media for distinguishing brown and white wood-rotting fungi.** *Ann. Bot.* 12 (45), 1948 (53–64 + plate). 23 refs. O.B.D.

Describes a method of distinguishing in culture between white and brown wood-destroying fungi. A malt-agar medium incorporating a 0·007% concentration of various dyes was decolorized by white-rot fungi, but not by brown. Gentian violet and neutral red were the most satisfactory of the dyes tried. Complete decolorization of the dye takes place only when the oxygen concentration above the medium exceeds 6%. Decolorization is probably due to the white-rot fungi producing an extracellular oxidase system. *From authors' summary.*

[1908]. 31.42.11 : 12.11.15 : 12.21 : 31.3. NORD, F. F., and VITUCCI, J. C. **On the mechanism of enzyme action. XXXI. The mechanism of methyl-*p*-methoxycinnamate formation by *Lentinus lepideus* and its significance in lignification.** *Archives of Biochemistry* 15 (3), 1947 (465–71). 10 refs. L.S.

The results of the investigation indicate that methyl-*p*-methoxycinnamate has its origin in the cellulosic fraction rather than the lignin of wood. The origin of lignin from carbohydrates is discussed. [cf. *For. Abstr.* 10 (Nos. 297, 1128–9).]

[1909]. 31.42.11 : 31.3. LUTZ, L. Les altérations du bois par les champignons. Leur mécanisme. **[The processes of fungal decay of wood.]** *Rev. Bois Appl.* 3 (9/10), 1948 (8–11). [F.]

Discusses the factors favouring fungal attack and, briefly, the results of experiments showing the chemical nature of changes caused by it in the principal constituents of wood (a form of hydrolysis in the case of hemicelluloses, celluloses, lignin and pectic substances). The substances in wood which tend to inhibit fungal growth include: tannin, phenolic products, essential oils and resins.

[1910]. 31.42.11 : 31.3 : 34.6 : 33.1. JACOBS, S. E., and MARSDEN, A. W. **The role of antibiotics in the decomposition of sawdust. II. Inhibition of the growth of cellulose-decomposing fungi.** *Ann. appl. Biol.* 35 (1), 1948 (18–24). 12 refs. O.R.E.

The action of antibiotics present in cold-water extracts of sawdust from a variety of coniferous woods was tested on 8 species of cellulose-decomposing fungi. Inhibition of the growth of *Stachybotrys atra* and *Chaetomium indicum* was marked, of *C. globosum* only slight. Some stimulation in the growth of *C. globosum* was noted in 100 and 50% extracts after 6 days' incubation, and this species seems to merit trial as an agent for decomposing sawdust. The extract also stimulated the formation of perithecia in both *Chaetomium* species. No marked inhibition or stimulation of growth was noted in *Aspergillus terrens*, *A. fumigatus* or 3 species of *Penicillium* tested. [Cf. *For. Abstr.* 9 (No. 1620).]

[1911]. 31.42.11 : 12.26–8 : 12.21 : 34.26. LUTZ, L. Sur la dégénérescence progressive des éléments anatomiques du bois par les champignons lignicoles. L'*Acacia verek* Guill. et Perr. et le polypore hispide. **[The progressive degeneration of the anatomical elements of wood by the action of lignicolous fungi. *Acacia verek* Guill. et Perr. and *Polyporus hispidus*.]** *C.R.Acad.Agric.Fr.* 32, 1946 (369–70). 2 refs. [F.] E.M.B.

Wood specimens from *Acacia verek* (=*A. senegal*) were soaked in water and inoculated with *Polyporus hispidus* in order to compare the gum resulting from the degradation of the wood with the natural soluble gum. The process of disorganization was (with slight differences) similar to that of Beech exposed to *Daedalea quercina* [cf. *For. Abstr.* 5 (184)]. The resulting gum was insoluble in both cases. The author concludes that the solubility of gums is conditioned, not by the nature of the tree itself, but by the parasitic fungus.

[1912]. 31.42.11 : 12.21 : 31.3. LOHWAG, K. Untersuchungen über die Holzzerstörung

durch *Fomes Hartigii* (Allesch.) Sacc. et Trav. und *Fomes robustus* Karst. [**Research on the destruction of wood by *Fomes hartigii* and *F. robustus*.**] *Repr.* from *Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz* 50 (10), 1940 (481–94). 17 refs. [G.] P.R.

[1913]. 31.42.11 : 12.26–8 : 12.25 : 33.51. WEBB, S. **The resistance of some Australian timbers to decay by mine fungi.** *Proceedings of the royal Society of Victoria* (*n.s.*) 58 (1/2), 1947 (3–24). 21 refs. O.R.S.

A study was made of fungi in pure culture from decayed mining timbers or from fruiting bodies present in an Australian zinc mine. The chief fungi isolated were *Coniophora cerebella*, *Polyporus zonalis*, *Trametes serialis*, *Poria xantha* and *Merulius pinastri*. Others were not identified. Inoculations of some Australian timbers were made, using soil as a medium, in order to determine the comparative resistance of various woods. Results, presented in tables and graphs, are discussed. *C. cerebella* and an unidentified isolation D_2, were the most potent of the wood-destroying fungi: *Eucalyptus pilularis*, *E. maculata*, *E. rostrata* and *E. microcorys* showed outstanding resistance to fungus attack, though decayed to some extent by *C. cerebella*. *E. regnans* was decayed very readily by all the fungi tested, *E. obliqua* slightly less so. *E. capitellata* and *E. saligna* were very susceptible to attack by *C. cerebella* but were more resistant than *E. regnans* and *E. obliqua* to other fungi. Results with *Callitris glauca* were variable, probably owing to an unequal loss of the volatile acid to which it owes its durability. *From author's summary.*

[1914]. 31.42.11 : 12.26–8 : 44.3. **Field tests.** *Rep. For. Prod. Aust. 1947–8*, 1948 (39–40).

A final inspection was made of test specimens installed in 1938–9 to find whether various heart rots of Jarrah [*Eucalyptus marginata*], occurring in the living tree, continue to develop in converted timber in contact with the ground. The tests show that most heart rots of Jarrah do not extend during service.

31.43. Attack by Animal Organisms

See also *For. Abstr.* 10 (Nos. 1953–5, 2079–87, 2143).

[1915]. 31.43 (595) : 13.2 : 13.2 : 35. BROWNE, F. G. **Insects and the export trade.** *Malay. Forester* 11 (4), 1948 (141–6).

The danger of introducing ambrosia beetles (with the possible exception of *Xyleborus testaceus*), powder-post beetles (*Minthea rugicollis*), furniture beetles, and dry-wood termites from Malaya into the principal timber-importing countries is considered to be negligible. There are possibly greater risks of the introduction of *Heterobostrychus aequalis* and *Xylopsocus capucinus* (Bostrychidae) and the longhorn beetle, *Stromatium longicorne*. Preventive measures in Malaya are briefly discussed. *From author's summary.*

[1916]. 31.43 : 12.25 : 13.2 : 32.82. MORGAN, C. V. G. **The biology of *Monochamus notatus morgani* (Coleoptera: Cerambycidae).** *Repr.* from *Proceedings* (*1947*), *Entomological Society of British Columbia* 44, 1948 (28–30). P.R.

[1917]. 31.43 : 13.2 (944). **Pin hole borers in New South Wales.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 3 (4/6), 1948 (7–9 + drawings).

[1918]. 31.43 : 13.2 : 33.36.1. BAVENDAMM, W., and SCHMIDT, H. Die Holzbohrmuscheln oder Terediniden: ihre Lebensweise, Schädlichkeit und Bekämpfung. [**The ship-worms or Teredinidae: their life history, damage and control.**] *Merkbl. Reichsinst. Forst- u. Holzw., Hamburg* (*Ser.* 2) No. 3, 1948. pp. 20. 32 refs. [G.e.f.sp.] P.R.

Cf. *For. Abstr.* 10 (Nos. 2086–7).

[1919]. 31.43 : 13.2 : 12.26–8 (931). [**Resistance of indigenous New Zealand species to marine-borer attack.**] *Rep. N.Z. For. Serv. 1947–8*, 1948 (49).

Cf. *For. Abstr.* 10 (No. 1852).

31.44. Injury by Chemicals

[1920]. 31.44 : 12.25 : 12.26–8 : 31.22.2. **Effects of corrosive chemicals on physical and mechanical properties of wood.** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (46–7).

Tests on the effect of different concentrations of H_2SO_4 and NaOH on Teak and Cypress (*Cupressus torulosa*) indicate that absorption and penetration are very rapid in alkali solution, and increase with rise in strength of the solution; penetration of H_2SO_4 solutions is comparatively slow, and wood strength only

gradually decreases as the period of treatment is increased. NaOH causes enormous swelling of wood, much above water-swelling, whereas the swelling with H_2SO_4 is less than with water. In the case of Teak, 12 weeks' soaking in 5% NaOH solution caused about 70% loss of strength (based on water-soaked pieces), but the loss in strength under identical conditions of soaking in 40% H_2SO_4 was only about 45%. Cypress has been found to be more resistant than Teak to corrosion.

[1921]. 31.44 : 12.25. NARAYANAMURTI, D., and RANGANATHAN, V. **Resistance of wood to corrosion by hot chemicals.** *Indian For. Leafl.* No. 101, 1947. pp. 3 + 1 gph.

Results of experiments on the action of hot chemicals on *Cupressus torulosa* are described and tabulated. Of the chemicals tested, NaOH was the most corrosive, followed by HCl, with H_2SO_4 the least corrosive. The wood is reasonably resistant to H_2SO_4 in concentrations of up to 10%, and HCl up to 5%. Various preservatives were tried; of these, phenol-formaldehyde and Cashew (nut shell) oil paint were the most satisfactory.

31.45. Injury by Fire

[1922]. 31.45 : 12.25. WILKES, G. B. **Wood flammability under various conditions of irradiation.** *Report, Division B, National Defence Research Committee, Office of Scientific Research and Development* No. 432 (Ser. No. 195), 1942. pp. 11 + 2 photos, 2 dgms., 9 gphs. P.R.

The time for ignition and the persistence of the flame were determined for 550 Spruce samples conditioned at different relative humidities and exposed to a radiant source of different known intensities. The results are expressed in graphs.

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 10 (Nos. 1852, 1992, 2224).

[1923]. 31.8 : 12.25 : 55. LEONT'EV, N. L. Vliyanie vozrasta na kachestvo drevesinȳ sosnȳ. **[Influence of age on the quality of Scots Pine timber.]** *Priroda, Moskva* 37 (4), 1948 (53–5). 8 refs. [Russ.] A.C.P.

Reviews previous Russian literature on this question and gives the results of tests on 14 stems, aged 80–280 years, from the Verkhne-Tavdinsk district, Sverdlovsk: (1) The difference with age in the chief physical and mechanical properties was 5–10%, which is not of practical significance under present conditions. (2) The change in properties followed a regular trend: specific gravity, latewood %, crushing strength and impact bending strength increased to a maximum at about 160 years of age and then decreased somewhat. (3) The specific gravity, crushing strength and impact bending strength of heartwood exceeded those of sapwood by 5–10%. The difference in strength was more accentuated in old than in young trees. (4) Buttwood was 10–15% better than topwood for all the properties tested. The maximum difference (30–35%) occurred at about 160 years of age, and on an average, the difference between buttwood and topwood was slightly less in old than in young trees.

[1924]. 31.8 : 12.26–8 : 31.27. **Structure in relation to properties. Brittle heart.** *Rep. For. Prod. Aust. 1947–8*, 1948 (10).

When steamed green specimens of *Eucalyptus regnans* were subjected to compression tests parallel to the grain (the wood being kept as hot and plastic as possible during loading) minute compression failures were developed in areas far removed from that of the macroscopic failure. Green, unsteamed control specimens, subjected to the same test, developed compression failures only in the areas immediately adjacent to the macroscopic failure. The experiments indicate that, under certain conditions, the minute compression failures, which are indicative of brittle heart, can occur over a wide area, and it is thought that this fact might help to explain the development of brittle heart in the living tree.

32. HARVESTING OF WOOD. LOGGING

See also *For. Abstr.* 10 (Nos. 1839, 2353).

[1925]. 32 : 01.2 (73). SIMMONS, F. C. **Northeastern loggers' handbook (preliminary review edition). Sect. 18. Glossary of terms.** Ntheast. For. Exp. Sta. 1947. pp. 20.

[1926]. 32 : 01.4 : 07.7. SIMMONS, F. C. **Choosing methods and equipment for logging.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 18, 1948. pp. 19.

[1927]. 32 : 07.7. McGINN, E. P. **Cooperstown logging equipment demonstration.** *Paper Tr. J.* 127 (15), 1948 (57–60). P.R.

An illustrated description of logging equipment, including 2 portable sawmills, 4 types of chain power saw, the 'TreeP' tree planter, sulkies and log-loaders.

[1928]. 32 : 07.7 (71). ST. AUBIN, A. A. **Some developments in mechanical logging.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 970 (B–1), 1948. pp. 4.

Notes on recently developed equipment including a pulpwood handling vessel, a trailer unit, pre-loaders, a logging tower, and a logging yarder.

[1929]. 32 : 07.7. BROWN, W. E. **Use and maintenance of [wire] logging ropes in Eastern Canada.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 982 (B–11), 1948. pp. 27.

[1930]. 32 : 07.7. SIMMONS, F. C. **Good logging practice No. 12. Selection and use of wire rope and accessories.** *Timber of Canada* 9 (3), 1948 (39–43).

[1931]. 32 : 07.7 (714) : 23.1. SMITHERS, L. A. **Forest conditions after logging on the Quebec north shore.** *Silv. Res. Note For. Serv. Can.* No. 88, 1948. pp. 12 + 4 photos, 10 tbls.

Data are presented which indicate that the residual stand left after logging by mechanical methods is just as satisfactory as that left by conventional methods of logging. The number of trees of 1 in. d.b.h. and over and the % stocking of advance growth are the same, and the possibilities of reproduction from seed appear to be slightly superior on the mechanically logged area. The comparative amounts of wood removed by the 2 methods are very similar, but the conventional methods appear to deal more efficiently with the smaller merchantable trees, while mechanical methods reduce wastage by the extraction of tree lengths rather than 4-ft. bolts.

[1932]. 32 : 12.26–8. SCHANTZ-HANSEN, T. **Logging methods and peeling of Aspen [*Populus tremuloides*].** *Lake St. Aspen Rep.* No. 3, 1948. pp. 13.

[1933]. 32 : 12.26–8 : 76.1. ZASADA, Z. A., and ZEHNGRAFF, P. J. **Logging costs of Aspen [*Populus tremuloides*].** *Tech. Notes Lake St. For. Exp. Sta.* No. 304, 1948. p. 1.

32.1. *Marking of Trees and Coupes*

[1934]. 32.1 : 82 : 76.1. MCLINTOCK, T. F. **Cost of timber marking in pulpwood stands.** *J. For.* 46 (10), 1948 (763–4).

Records of man-days spent in marking 8 areas of pulp and paper company holdings in the north-eastern U.S.A. have been summarized. The average cut was slightly more than 7 cords per acre, or about 50 cords marked per man-day. At a wage of $10 a day the cost was 20 cents per cord for labour. It was also found that a gallon of paint, mixed in equal parts with kerosene, would mark 15 acres, or 120 cords. This was an additional cost of something less than 2 cents per cord. Field experience indicated that a crew of 5 (one tally man and 4 markers) provided the smoothest working unit. [Cf. *For. Abstr.* 9 (No. 1630).]

32.2. *Felling and Related Operations*

See also *For. Abstr.* 10 (Nos. 1580, 1957, 2096, 2206).

[1935]. 32.22 : 12.26–8 (54) : 31.8. **[Seasoning of girdled trees.]** *For. Res. India Burma 1945–6*, Pt. 1 [1947?] (44–5).

A set of girdled trees of *Tectona grandis*, *Xylia xylocarpa*, *Hopea parviflora* and *Ougeinia dalbergioides* were felled after having been kept girdled for 3 years. Drying was greater in Teak than in other logs, and longitudinal cracks in them were attacked by borers, though damage was light. The condition of *Ougeinia* logs was similar to that of Teak. *Xylia* logs developed fine surface cracks during the girdling period and also had numerous borer holes. *Hopea* logs had deep surface cracks as well as borer attack. The girdling of *Hopea* is considered dangerous, as it leads to mass reproduction of a harmful beetle. Teak and *Xylia* logs obtained from girdled trees were also tested for floating. The *Xylia* log remained floating for 2 months, after which it sank. Teak was still floating, with ¼ of its volume above water, after 4 months. There was no difference at the end of air seasoning between the condition of planks from girdled trees and those from ungirdled controls.

[1936]. 32.25 : 07.7 (431–5) : 33.10. PARSONS, G. W., *et. al.* **German hand tools industry. Short and cross-cut saws.** *BIOS Final Rep. Brit. Intell. Obj. Sub-comm.* No. 1628 (Sect. No. 3), Item No. 31, [*n.d.*] pp. 68. P.R.

[1937]. 52.25 : 07.7 (485). HULTMARK, N. Redskap i huggningsarbetet—typer och utbredning i Norrland och Dalarna. **[Tools in logging work—types and distribution in Norrland and Dalecarlia.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (36–53). 7 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 23.)

Cf. *For. Abstr.* 9 (No. 2301).

[1938]. 32.25 : 07.7 (485). FLODMAN, B. Några synpunkter på redskapsvården i skogsarbetet. **[Notes on tool maintenance in forestry work.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (54–71). 13 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 24.)

Deals with the normal tool outfit of N. Swedish woodcutters and its cost; the time and cost of saw-filing; effect of proper tool maintenance on the workers' output, which may be thus increased by about 22%; experiments on saw wear under field conditions, with provisional deductions as to the 'optimum filing interval' (where saws were used for felling only, this was 7–8 days for barked and 5 days for unbarked timber; where both felling and crosscutting were done with the same saw, the corresponding figures were 4 and 3 days); courses in tool maintenance so far organized; instructional work organized by forest owners; filers working with logging gangs; and central workshops for tool maintenance [cf. *For. Abstr.* 9 (No. 2302)]. Though filing by the woodcutters themselves is the cheapest, the standard of precision is lower than that attained by skilled filers, and satisfactory tool maintenance by woodcutters demands continued provision of instructors. Where suitable, central workshops should be installed, but the merits of centralization and decentralization will vary according to the region concerned. In small communities a promising solution is to interest one or a few workers—possibly not fully able-bodied—in tool maintenance, as either a whole-time or part-time occupation.

[1939]. 32.25 : 07.7. THOMSON, R. **Care and maintenance of power chain saws.** *Pulp Paper Mag. Can.* 49 (10), 1948 (142, 144).

[1940]. 32.25 : 07.7. **New chain saw.** *Sth. Lumberm.* 177 (2221), 1948 (78).

Describes a new light-weight, power-driven chain saw, with an all-purpose chain for fast ripping or crosscutting and a 2-cycle power unit of completely new design. Outstanding features are the recoil starter designed to eliminate kicking, the special magneto, which delivers an extremely hot spark even at low r.p.m., an automatic clutch and a full 360° swivel.

[1941]. 32.25 : 07.7 : 82. DOUDA, V. Upotřebitelnost motorových řetězových pil zn. 'Rinco', typ 1·3 a zn. 'Hunziker', typ B.K.S. při těžebních pracích v lese. **[Serviceability of the 'Rinco' type 1·3 and 'Hunziker' type B.K.S. motor chain saws for cutting operations in the forest.]** *Lesn. Práce* 27 (4/5), 1948 (130–50). [Cz.] [Státní výzkumné ústavy lesnické, Praha.]

Details the results, which are analysed in graphs and tables, of performance tests on the Rinco (Czech-made) and Hunziker (Swiss-made) chain saws, both petrol-driven, in felling and crosscutting Spruce timber. On the whole the advantage lay with the Hunziker model owing to better construction with higher-quality material, and greater availability of spares and accessories.

[1942]. 32.25 : 07.7 (47). PATSIORA, P. P. Otechestvennÿe elektropilÿ. **[Russian electric power saws.]** *Lesnaya Prom.* 1948 (5), (4–10). [Russ.]

Reviews about 40 types of Russian power saws, including those already factory-produced plus others coming up for production or in the experimental stage, and gives brief descriptions of many of them under the headings: The VAKOPP chain saw (with a tabular conspectus of the variations in characteristics of this model as produced by 5 different factories); experimental chain saws; chain saws with H.F. motors; disk saws, and bow saws. The chief characteristics of 32 different chain saws are set forth in a table in which the VAKOPP factory-produced model takes 13th place, after a series of models not yet in production, of which the types with H.F. motors are regarded as the most promising.

[1943]. 32.25 : 07.7. PATSIORA, P. P., and GINZBURG, Z. B. Poluchenie povÿshennoy chastotÿ toka dlya elektropil. **[Obtaining higher-frequency current for electric saws.]** *Lesnaya Prom.* 1948 (6), (8–10). [Russ.]

Electric saws operated with H.F. current (200 cycles) are less than half as heavy as those

run on normal current. Until special generators are mass-produced in the U.S.S.R., it will be necessary to adapt existing equipment to supply such current. Hints are given on possible solutions to this problem, viz. (1) conversion of asynchronous electric motors into synchronous or asynchronous H.F. generators and (2) use of special transformers for converting ordinary (50-cycle) A.C. to the requisite frequency.

[1944]. 32.25 : 82 (436). Normalleistungstafel für die Waldarbeit. **[Standard performance table for forest work.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (7/8), 1948 (54–6). 4 refs. [G.]

Presents: (1) Tables of points for variations in topography, branchiness, species and condition of wood, barking conditions and type of felling, the sum of such points giving a difficulty rating for the job. (2) A table of man-hours per solid cu.m., arranged by average diameter and difficulty ratings as obtained from (1), for the job of felling, converting and stacking coniferous timber in lengths of 2–6 (average 4·6) m., under the general conditions of the Austrian Alps.

[1945]. 32.25 : 82 (485). NENZELL, G. Några resultat från tidstudier av gagnvirkeshuggning. **[Some results from time studies of timber logging.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (1–35). 21 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 22.)

Analyses results obtained from studies in Norrland and Dalecarlia with the object, not of determining standard rates of work, but of discovering what share the individual jobs have in the total time taken for felling, crosscutting, barking, etc., and of elucidating the importance of some of the factors affecting the relative difficulty of these jobs. The tables presented show timings (*a*) in summary form for the whole range of operations covered; (*b*) for individual jobs, e.g. walking from tree to tree, clearing snow preparatory to felling, trimming, barking, as influenced by various factors. The number of such factors is large, and much more detailed study will be needed before truly objective price scales for logging work can be established.

[1946]. 32.25 : 82 : 13.11 (485). ZOTTERMAN, Y., and LUNDGREN, N. Studier över tungt kroppsarbete: arbetsfysiologiska och arbetstekniska undersökningar vid skogsavverkning. **[Studies on heavy manual work: investigations into the physiology and technique of work in logging operations.]** Förlags AB Affärsekonomi, Stockholm. 1948. pp. 324. 17 refs. [Sw.e.] Price Kr. 20 (31*s.* 6*d.*).

In 1941 some physiological studies were made within the Värmland Forest Work Studies Association [see *For. Abstr.* 5 (81–3)], but as it became clear that a better organized and better financed body was required for such specialized research, support was canvassed for a temporary *ad hoc* Committee for Research on the Physiology of Work [*Arbetsfysiologiska Undersökningen*], of which the present book is the final report, dealing with the investigations made during 1943–6.

There are 9 chapters, concerned with: (1) The need for the investigation. (2) General physiological problems of heavy work, under the headings psychical and physical fatigue, anaerobic and aerobic work, constitutional factors, and the nature of training. (3) The experimental stations and the human subject of the experiments. (4) Energy output in logging work, with sections on:—food studies to determine total daily energy output; the respiratory method of determining O_2 consumption during individual logging jobs; measurements of body temperature and of pulse rate during work, both calibrated by parallel recordings during bicycle ergometer tests, as indexes to energy output. The last two methods proved accurate enough for most practical purposes. (5) Studies of skilled woodcutters over periods of 9–14½ months' work on a time schedule that aimed at separating working periods by frequent short rests and spreading total exertion per day over a fairly long total time. These studies included time and production recordings as well as medical and physiological work during which special attention was paid to the functioning of the heart and circulation [cf. *For. Abstr.* 8 (p. 463)]. (6) Nutrition, blood-sugar concentration and the effect of drinking coffee (as compared with that of an ersatz, non-stimulating drink) on workers' output—an effect which, though statistically a little unreliable, appeared to be favourable. (7) Technique of work, especially in sawing and barking, including posture and motion analyses made with the help of films. The results cover optimum working heights, types of movement,

and working speed. (8) Notes on the experience gained as to the methods of study used. (9) A summary of principles for rational forest work, under the headings:—medical advice on taking up forest work; the need for training; division and use of the working day; nutrition; hygiene; periodic medical inspection; and working technique.

An appendix reviews the statistical methods employed. The book is copiously illustrated.

[1947]. 32.25.5 : 07.7. **Hydraulic barking of sawlogs.** *W. Cst. Lumberm.* 75 (10), 1948 (58–9, 93).

Describes a hydraulic barker for sawlogs, designed and used at Longview, Wash., by the Weyerhaeuser Timber Co., the first of its kind to be used in conjunction with sawmilling in the Douglas Fir region. The barker can handle logs of 18–120 in. diameter, 16–50 ft. in length, and with a maximum weight of 37,000 lb. The purpose of the installation is to provide bark-free slabs and edgings for the Company's new sulphate pulping mill at Longview.

[1948]. 32.29. MOLDOVAN, I. Curătirea parchetelor. **[Clearing the felling site.]** *Rev. Pădurilor* 3 (3), 1948 (95–6). [Rum.f.]

The author describes the best method of collecting and piling slash in coniferous forests in mountainous areas. It should be piled in long parallel heaps or windrows following the direction of the contours. The width of the heaps at the base should not exceed 1·5 m. and the distance between them should be not less than 4 m., nor more than 10 m.

[1949]. 32.29.2 : 43.11. AUFDERHEIDE, R., and MORRIS, W. G. **Broadcast slash burning after a rain.** *W. Cst. Lumberm.* 75 (9), 1948 (79–80, 82–3).

Practical recommendations for the slow burning of slash after rain. [Cf. *For. Abstr.* 8 (No. 664).]

32.7. *Loss in Logging. Incidental Waste*

See also *For. Abstr.* 10 (No. 2043).

[1950]. 32.7 : 32.9 : 33.17 : 76 : 12.25. MATSON, E. E., and WRIGHT, N. L. **An appraisal of a Douglas Fir re-logging operation.** *Timberman* 50 (1), 1948 (170–5).

Information on the value of salvaged logs was obtained from a study made in August, 1948, on the Dwyer Lumber Company's operations near Portland, Oregon. The stands, which were logged 3½ years before the re-logging, had consisted chiefly of Douglas Fir about 250 years old with an under-storey of Hemlock [*Tsuga* sp.]. The Douglas averaged 40,000 bd. ft. per acre and contained very little defect. The salvage was chiefly small trees from the Hemlock understorey taken to a 5- or 6-in. top, plus short chunks of Douglas Fir down to 8 ft. in length. The logs were converted by a Swedish gang saw in Portland. The logging and sawmilling operations are described and data on costs and recovery are given. Operating costs were high, but in this case, where an assortment of grades of finished, dried lumber was produced, the undertaking paid. Profits might be small, however, if the lumber had to be sold on a rough green basis. Overrun was not high, partly because the logs were scaled in short lengths as they entered the mill. The re-logging operation increased the yield of logs on a given area by 25%. Both yield and average lumber-grade recovery would be improved if salvage logging were carried out immediately after the main operation.

[1951]. 32.7 : 33.17. DAVIS, E. M. **Lumber recovery from 'woods waste' logs.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (341–8).

The Forest Products Laboratory at Madison recently received a load of 'woods waste' logs from Oregon (i.e. material left in the woods because the operator doubted whether it could be milled properly). The Douglas Fir logs (all more than 8 ft. long) were converted in order to determine how much lumber and what qualities could be obtained from them. Details of recovery are given. The wide range of lumber obtained from these logs suggests that some of them might be milled at a profit.

32.8. *Grading and Storage of Wood in the Rough*

See also *For. Abstr.* 10 (No. 2143).

[1952]. 32.82 : 31.42.11 : 12.25. SUOLAHTI, O. **Laboratory tests on the effect of submersion in water on decay of Pine (*Pinus sylvestris*).** *Papp. Trävarutidskr. Finl.* 30 (19), 1948 (341–2). 5 refs. [E.] P.R.

Tests were made on small clear specimens of Pine sapwood. Group 1 was submerged in water which was changed daily, Group 2 in water which was not changed for the duration

of the test. After 6 months, the specimens were dried for 72 hr. at room temperature and for 24 hr. at 105° C., then weighed and subjected (with control specimens) to attack by wood-destroying fungi for 3 months, after which they were weighed again. The results are tabulated. Group 1 showed slightly less decay than the controls but the difference is too small to be significant. Decay of specimens from Group 2 varied considerably with the species of fungus. Attack by *Coniophora cerebella* was similar to that in Group 1. *Lentinus lepideus*, *Lenzites sepiaria* and *Trametes serialis* hardly attacked Group 2 at all. Further tests under similar conditions gave similar results. It is suggested that, during the soaking, heat-resisting antibiotic substances are formed by micro-organisms and that *C. cerebella* is less affected by these than the other fungi. *L. lepideus* appears to be most susceptible, which may be of importance as it is especially resistant to many organic and inorganic preservatives. Standing water would be more favourable to the growth of micro-organisms than water changed daily. Further exhaustive investigations are needed.

[1953]. 32.82: 31.43 : 33.36.1 : 12.26–8. **[Water soaking of poles against bostrichid attack.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (106–7).

Freshly felled poles (barked) of *Shorea robusta* and *Dalbergia sissoo* (6 ft. long and 1½–2 ft. in girth) were immersed in water in April 1944 and taken out for exposure to borer attack in batches at monthly intervals up to 5 months, to determine the effect of different periods of water soaking on their liability to bostrichid attack. The results after 1½–2 years' exposure are as follows. Poles of both species, immersed only for one month, were badly attacked on exposure. *S. robusta* poles were also badly attacked after 2 months, but *D. sissoo* showed decreased attack. Poles of both species immersed for 3 months or more were not attacked, and it appears that 3 months' immersion gives protection against bostrichid attack to these species.

The initial starch content of these poles was high, and though a certain amount of starch depletion took place during the period of water-soaking, it was not sufficient to account for the results, which are believed to be due to the leaching out of sugars.

[1954]. 32.82 : 31.43 : 31.3 : 12.29 : 32.24. **[Starch depletion in felled Bamboo.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (102–3).

It has been found at Dehra Dun that in felled Bamboo culms the amount of starch, which determines their susceptibility to borer attack, decreases at varying rates according to the conditions and times of storage. In order to determine the practical application of this finding, observations were made for a period of 2 years with culms of *Bambusa nutans* and *Dendrocalamus strictus* felled weekly and kept in shade or in the open, by testing them periodically for starch depletion. The following conclusions were reached. Starch depletion is considerably inhibited by exposure to the sun and is greatest in culms stored in the shade. At Dehra Dun this depletion is most rapid in the rains, starch dropping to nil in July and August in 3 weeks, and to a low level in September in about a month. In October and November also, when the original starch is low, the depletion is also rapid, leaving only traces of starch after one month. In December and January about 3 months are necessary to bring the starch down to a safe level. Culms felled from about February to the beginning of the rains, especially during the hot, dry months, are liable to serious attack. An investigation has also been started at Dehra Dun to find out if the age of the culm influences starch depletion.

[1955]. 32.82 : 31.43 : 12.26–8 (54) : 32.24 : 32.25. KHAN, A. H. **Insect borers of newly felled timber and their control. Part I.** *Indian For. Bull.* (*n.s.*) *Entomology* No. 136, 1947. pp. 8.

An investigation was made into methods of preventing insect damage to newly felled timber of *Vateria indica*, *Dipterocarpus indicus*, *Terminalia belerica* and *Polyalthia coffeoides* by adjustments in times of felling and in methods of dealing with the timber after felling. The study was concentrated on the seasonal incidence of the borers and the liability of the timber to attack under different conditions of exposure. The following conclusions were drawn:—(1) To avoid cerambycid attack, logs of *V. indica*, *D. indicus* and *T. belerica* must be barked not later than 2 months after felling and those of *P. coffeoides* within a month of felling. (2) Barking should be done outside the forest and the barked logs stored in the

open to minimize danger from pinhole borers, the attack of which is accelerated in forest shade. (3) Keeping the bark intact for 2 months for *V. indica* and *T. belerica*, storing them preferably in the shade, reduces attack by Bostrichidae, but makes no appreciable difference in the case of *D. indicus*. (4) Timber sawn immediately after felling is liable to serious Bostrichid attack and there are indications that the attack is reduced considerably if the timber is kept in log form for about 3 months before sawing. (5) Bostrichid attack in logs is confined to fellings of October to February in *V. indica*, August to November in *D. indicus* and October to March in *T. belerica* and *P. coffeoides*.

It is pointed out that the experiments were made in Madras and the conclusions may not hold good for the whole of India.

[1956]. 32.82 : 32.92–4 (485). HEDERSTRÖM, T. Några avläggsproblem. **[Some log-depot problems.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (151–79). 18 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 29.)

Discusses the converging and sometimes conflicting interests of various parties (e.g. timber-floating organizations, hydro-electric stations, hauliers, scaling organizations, timber and forest owners) in log depots along waterways. Briefly reviews the need for proper drying to ensure buoyancy and prevent degrade, and considers in some detail the siting and layout of depots on the banks of waterways, with illustrated suggestions on stacking practice and the rolling of logs into the water. A few notes are included on stacking logs directly on the ice, a practice which has been progressively disappearing in Sweden owing to the difficulty of securing adequate drying before the ice breaks.

32.9. *Transport*

[1957]. 32.91 (485) : 32.2 : 38.3. MATTSSON MÅRN, L. Transportoperationerna och deras samspel vid vinteravverkning med häst i Norrland. **[Transport operations and their interplay in winter logging by horse in Norrland.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (72–98). 4 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. Arbetsstud-Avd.* No. 25.)

Discusses different systems of logging practised in Norrland and Dalecarlia from the point of view of the resulting differences in the various phases of log transport and the form taken by the extraction road system. Attempts to systematize the names of the basic phases of log transport in Sweden and illustrates their relationship diagrammatically. Reviews some questions of principle in the development and rational linkage of the different phases of transport, emphasizing the importance of the forest owner's assuming responsibility for the broad planning of the logging operation and that of rationalizing transport from the very beginning, i.e. the point where the woodcutter takes the first step by felling trees in the most convenient direction, which he soon learns to appreciate if it is also his job to drag the logs to the extraction road.

[1958]. 32.91.11. SIMMONS, F. C. **Good logging practice No. 10. Ground skidding with horses.** *Timber of Canada* 8 (12), 1948 (38–41, 58, 74–6).

[1959]. 32.91.12 : 07.7. SIMMONS, F. C. **Good logging practice No. 11. Skidding with tractors.** *Timber of Canada* 9 (2), 1948 (38–41, 92, 94).

[1960]. 32.91.12 : 07.7. DAY, R. K. **Improved harvesting methods. Equipment survey notes. A 'jeep' logger.** *Rep. U.S. For. Prod. Lab., Madison* No. R1637–25, 1948. pp. 2. P.R.

An illustrated description of the equipment—a jeep fitted at the rear with arch and winch, and cable attachments. The cable passes over the arch and is fastened to the end of the log, which, when the cable is reeled in, is raised sufficiently to clear the ground.

[1961]. 32.91.12 : 07.7. JIRIKOWSKI, G. Gedanken um den Schlittenbau. (Beschreibung der drei idealsten Schlittenformen). **[Thoughts on sledge construction: description of the three best types [for hand sledging in Austria].]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (5/6), 1948 (38–9). [G.]

[1962]. 32.91.22 : 07.7 (485). KJELLBERG, G. Något om kälktyper och lastning. **[Notes on sledge types and loading.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (135–50). 10

refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 28.)

Cf. *For. Abstr.* 8 (Nos. 333, 337); 9 (No. 1651).

[1963]. 32.91.22 : 01.1 : 13.2. LIDSTRÖM, B. · Några grundläggande kalkyler kring skogshästen och transporterna på basvägar. **[Some basic calculations regarding the 'forest horse' and [winter] transport by main logging roads.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (107–34). 10 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 27.)

Discusses factors governing haulage efficiency, with special reference to the draught capacity of the horse and the resistance to sliding of sledge runners. Stresses the difficulty, with the inadequate data yet available, of assessing the draught power of a horse objectively. The requirements as to weight, strength, etc., in a forest horse differ from those of other horses and may well change as motor transport is extended and long hauls by horse become unusual. Making a number of reasonable assumptions, a method is shown of calculating the effect on maximum draught capacity of the haulage trip distance, and a graphical example is given. A nomograph is also presented to show the relationship between load, draught capacity of horse, gradient of snow or iced road and the practical length of haul possible. This nomograph can be used for comparative purposes only, as the data for tractive power of the horse are inadequate for absolute values. Different uses of the correlations are discussed.

[1964]. 32.91.22 : 07.7 : 32.96. MCCOLL, B. J. **The McKone preloader.** *Woodl. Sect. Index Pulp Pap. Res. Inst. Can.* No. 987 (B–10), 1948. pp. 3.

The pre-loader consists of 4 steel ramps mounted in pairs on 2 skid platforms; bunk carriers are mounted on an inclined plane on the ramp top. The rear pair of ramps is equipped with a tripping device to release the loaded bunk carriers, and cables connect the rear and front bunk carriers on either side to control release of the front bunk carriers. A set of bunks is mounted on the carriers and log-loading completed. The other set of bunks is removed from the empty truck, which is backed under the pre-loader. Locating pins on the bunks come into contact with a locking device on the truck-trailer chassis and are locked into place. Release of the tripping device then allows the loaded bunks to slide down the inclined plane, pushing the truck forward and transferring the load from the ramp to the truck, which then moves off. The bunk carriers are pushed back, the other set of bunks dropped on the pre-loader and loading is begun again. The whole operation takes 2½–3 minutes. The description is illustrated with photographs.

[1965]. 32.91.4 : 07.7. FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Inexpensive logging incline.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–20, 1947. pp. 2. P.R.

An illustrated description of an incline used for uphill logging in Kentucky. It follows ground irregularities except over rock outcrops, where it is braced with logs. The rails are a double thickness of low-grade 2 × 4s, the ties being made from short lengths. The log-hauling car is in 2 sections with flexible coupling. It is hauled to the top of the incline by a cable from a touring-winch on a tractor, backed up to the end of the track. The last section of the track is raised so that logs can be rolled from the car to the trucks.

[1966]. 32.92–4 : 07.7 : 12.26–8. MAKKONEN, A. Vanerikoivujen niputushankaluus. **[Difficulties in the bundling of plywood Birch logs.]** *Metsät. Aikak.* 1947 (4), (97–8). [Fi.]

The author gives figures to compare the time taken in the bundling of Birch veneer logs, conifer logs and 4-m.-long pulpwood. His first investigation concerned bundling by means of a side water channel into which the logs are introduced crosswise and from whose outlet at the river they fall on to chains, for bundling and floating away. The following table gives his results per bundle, per log and per cu.m.

	Per bundle	*Per log*	*Per cu.m.*
Veneer Birch [as unity]	100	100	100
Conifer logs	124	77	161
4-m. pulpwood	140	46	240

In the second investigation the bundling was effected by the logs being hoisted from the feeding channel on chains and lowered directly on bundling chains between two vessels in the river. The conifers were unbarked Pine and Spruce logs, rather thick (average 8·08 in.), as

were also the Birch veneer logs (average 8·65 in.). The results were:—

	Per bundle	*Per log*	*Per cu.m.*
Veneer Birch . . .	100	100	100
Conifers	108	99	64

The time taken by the conifers differed less here than in the first case owing to their greater top diameter.

In a third investigation the mechanism employed was a mere hand bundler, with Birch veneer logs and 4-m. pulpwood. Comparative times were:—

	Per bundle	*Per log*	*Per cu.m.*
Veneer Birch . . .	100	100	100
4-m. pulpwood . . .	57	22	126

The author calls attention to the wide variations in the time taken by the different bundling appliances employed and by the different sizes of the wood bundled, so that one appliance is more advantageous for some sizes and another for other sizes. Employers should ascertain the appliances suitable to each size.

[1967]. 32.92–4 : 12.26–8. MALÝSHEV, S. Splavlyat' fanernýe kryazhi bez utopa. **[Floating veneer logs without loss by sinking.]** *Lesnaya Prom.* 1948 (6), (14). [Russ.]

As an alternative, or preferably in addition, to 'sour felling' [cf. *For. Abstr.* 9 (No. 1654)], it is recommended that Birch logs should be treated before floating with an end coating of 10 parts wood tar plus 1 part ash, brushed on while hot and left 5–6 days to dry.

[1968]. 32.92–4 : 32.96. KUZNETSOV, D. V., and KOZHANOV, D. I. Nový sektsionnýy transporter dlya peregruzki korot'ya. **[New sectional conveyor for loading short logs [on to boats].]** *Lesnaya Prom.* 1948 (5), (15–8). [Russ.]

Describes, with diagrams, a portable universal chain conveyor for moving logs up to 50 cm. diam. and 0·5 to 3 m. long from bank to boat, boat to bank, or water to boat. The conveyor is of sectional construction, each section being independently powered by a 1·6-kw electric motor.

Notes are included on the lay-outs appropriate to the 3 operations detailed. The first models are expected to become available in 1948.

[1969]. 32.92–4 : 07.7 : 32.96. Vedestä autoon nostava kuormauslaite. **[A water-to-lorry hoist.]** *Papp. Trävarutidskr. Finl.* 30 (15), 1948 (264). [Fi.] P.R.

Describes a semi-automatic loading device, manufactured by Bröderna Ullströms Motor A.B., Åmål, and called 'Timmerhästen'. A rectangular frame 4 m. long and carrying a pair of endless chains fitted with hooks, is let down into the water, where logs are fed on to the hooks and carried up to a loading scaffold. Power is provided by the lorry wheel which friction-drives twin rollers shafted to a worm wheel and driving chain. The machine can handle 55 logs of some 5·5 cu. ft. each in 14–18 minutes. There are 2 models, the larger taking logs up to about 750 kg. on chains either 1·7 or 2·8 m. apart, and weighing 2·5 tons. The smaller model takes 500-kg. logs and weighs 2 tons. Costs of running are given against income derived for some 145,000 cu. ft. of logs.

[1970]. 32.92. TUOVINEN, A. Työsaavutukset veteen vierityksessä. **[Efficiency in rolling logs to water.]** *Metsät. Aikak.* 1948 (1/2), (5–8). [Fi.]

A report on the author's investigations (spring, 1947) on the efficiency of timber-launching operations from riverside depots, with particular reference to the variation in the time taken with the distance of the log piles from the river's edge. The material under study was piled and stacked on solid but very hummocky and stony ground and the observations covered the work of a squad of 4 men during 6 days.

One set of observations concerned 7 stacks of partially barked pulpwood logs 2 m. long, the stacks being 1·5 to 2·5 m. high, with their length parallel to the river, and at ½ m. intervals from each other, the nearest being right on the brink and the farthest some 17 m. away. Except for the stack on the brink, launching was done by rolling the logs along skids. In terms of effective working time and taking the brinkside stack (No. 1) as unity, the result was as follows:–

No. of stacks counting from brink.	1	2	3	4	5	6	7
Proportional rolling times.	100	207	241	334	412	551	715

The author points out that the rolling of the farthest stack (17 m. away) took 7 times the time taken by the riverside stack, and emphasizes the importance of piling wood as near the brink as possible, even though the high

stacking costs more. He recommends the use of roller chutes for stacks farther back. Distance affected the times taken for launching 2-m.-long, partly barked firewood even more, the increase being 30 and 45% for stacks 6 m. and 12 m. away respectively. The effect of distance on the time taken by larger, unbarked conifer logs was considerably less, despite the fact that the building of the skids took about twice as long as for pulpwood. When the distance increased from 8 to 16 m. the costs in Finnish marks per log of 5 cu. ft. rose from 4·05 to 5·35. The author emphasizes the importance of choosing suitably sloping ground for the stacks and of building them (with skids) as high as possible, so expediting the rolling. These advantages, however, diminish with the diminishing size of such logs.

[1971]. 32.94 : 07.7 (711). **New form of log towing.** *W. Cst. Lumberm.* 75 (8), 1948 (62, 121).

Two converted LST landing barges are being used by the Canadian Transport Co. in towing logs from Ucluelet to the Fraser River. The barges are 280 ft. long. Forty feet of the stern were removed in order to provide a swept-up bottom and stern. Beam is 50 ft., with a maximum load draught of 12 ft., giving a capacity of 600,000 bd. ft. of logs. The logs are loaded by the ordinary swinging-boom method and are stacked broadside on the deck, the whole load being secured from stem to stern by steel wires.

[1972]. 32.95 : 07.7. KOROLEFF, A., and SILVERSIDES, C. R. **Transport of wood by gravity over suspended wire.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 43 (B–8–g), 1948. pp. 8. 4 refs.

Recommends cable skidding as the best method of getting wood down steep slopes, and describes the necessary equipment and operation of such installations. The report is based on experimental operations following research studies. [Cf. *For. Abstr.* 9 (No. 346); 10 (No. 343).]

[1973]. 32.95 : 07.7 (437) : 76. PAPÁNEK, F., and JURGA, F. Ekonomické aspekty nových lesných lanoviek. **[Economic aspects of new forest cableways.]** *Lesn. Práce* 27 (1), 1948 (9–24). [Slovak.russ.e.] 8 gphs. [Vysoká škola pol'nohospodárskeho a lesníckeho inženierstva, Košice.]

The Wyssen and Lasso-Câble types of cableway [cf. *For. Abstr.* 10 (No. 342)] were introduced into Czechoslovakia in 1946 and are being used in the State forests with considerable success. The present paper includes cost analyses for both systems and shows that they need not lead to destructive logging methods but are well suited to intensive and conservative forestry. The authors develop formulae for the best use of the new equipment, together with nomographs to indicate the conditions under which it will be advantageous to move the equipment, as a whole or in part, to a fresh position.

[1974]. 32.95 : 38.4. HORATIIS, M. DE. Note e riflessioni sulle teleferiche. **[Notes on cableways.]** *Ital. for. mont.* 3 (4), 1948 (195–211). 4 refs. [It.]

Mainly an account of the installation and operation of the Wyssen cableway.

[1975]. 32.95 : 07.7. HAFNER, F. Erfahrungen mit dem Pohlig-Seilfördergerät P 500. **[Experience with the Pohlig P 500 cableway.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (11/12), 1948 (90–3). [G.]

Briefly describes the construction, operation and economics of a light cableway which can be built in about 2 weeks and works on the counterpoise principle, having 2 main cables (or only one if so desired) and 2 carriages, one going up as the other goes down. An endless live cable serves for hauling or braking. The normal length is 1,000 m. and the normal load per trip 650 kg. (maximum 1,000 kg.). It can be operated by gravity, by hand or by motor power (5–15 h.p., according to gradient). In the last case, it can be used to hoist logs from depressions.

Compared with the Wyssen system its advantages are independence of gradient, lower purchase price, possibility of operation by gravity, 2 main cables and use of the counterpoise system, while its disadvantage is the necessity of transporting timber from the stump to the loading station. Over skidders its advantages are lighter construction and greater portability, absence of damage to soil and young growth, greater effective length, lower purchase price, use of 2 cables and the counterweight principle, and economy in power; while its disadvantages are the need for other transport from stump to loading station,

smaller load and capacity, and higher costs of installation.

33. CONVERSION AND PRESERVATION OF WOOD

See also *For. Abstr.* 10 (No. 2353).

[1976]. 33 (431–5). KNIGHT, R. A. G., STEVENS, W. C., RICHARDSON, N. A., ARMSTRONG, F. H., HARRIS, P., and CAMPBELL, W. G. **The timber industry in Germany during the period 1939–45.** *Overall Rep. Brit. Intell. Obj. Sub-comm.* No. 3, 1948. pp. 16. 69 refs. [Forest Products Research Laboratory, Princes Risborough.] P.R.

Contains reports appraising the value of work done during the war in the fields of: composite wood manufacture; wood bending; pencil manufacture; wood structural research; logging, lumber and wood products, machinery and equipment; German wood preservatives other than coal-tar creosote; coal-tar creosote; and chemistry of wood and wood products, viz. (1) production of sugars, alcohol and yeasts from wood and sulphite waste liquor; (2) wood distillation; (3) production of vanillin and tanning materials from sulphite waste liquor; (4) sources of cellulose other than wood and cotton.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

[1977]. 33.1 : 07.7. CRUMP, H. **Use of carbide tools for wood-working.** *Sth. Lumberm.* 177 (2219), 1948 (74, 76, 78).

Describes various types of carbide-tipped tools, their maintenance and performance.

[1978]. 33.1 : 07.7 : 06.3. **Seen at the machine tool exhibition.** *Timber News* 56 (2112), 1948 (392–6).

An illustrated account of new woodworking machinery on show at the Machine Tool and Engineering Exhibition held in London in September, 1948. Machinery described included saws, planers, planes, drills and other hand and machine woodworking tools.

Use of Wastes

See also *For. Abstr.* 10 (Nos. 1910, 2043, 2060–3, 2111).

[1979]. 33.1 : 34.6 : 11.47.12. MCINTYRE, A. C. **Why waste wood?** *Soil Conserv.* 14 (4), 1948 (75–8). 10 refs.

Reviews the (rather scanty) literature on the utilization of sawdust and wood chips as soil improvers [cf. *For. Abstr.* 7 (Nos. 1988–9); 8 (No. 349; p. 335); 9 (p. 260); 10 (No. 2039)], and describes some unpublished experiments by farmers in the U.S.A. The studies which have been made on the value of wood as organic manure lead to the conclusion that wood itself does not produce a toxic soil condition, but its introduction into the soil causes a reduction in nitrification which is reflected in decreased plant growth. It seems to be established that if N is added with the wood, increased crop yields will result. It is also accepted that a sawdust admixture has a beneficial effect on the physical structure of soils. Sawdust added to heavy soils has improved their infiltration rate, aeration and workability. Sawdust and shavings have a high water-absorbing capacity and contribute this quality to both heavy and sandy soils. They have also been successfully used as a mulch for orchard and field crops. The use of sawdust and shavings as bedding material for farm stock has excellent results. As absorbents they are about equal to chopped straw and twice as effective as unchopped wheat straw. For balance, about 50 lb. of 20% superphosphate per ton of manure should be added. Farmers who have used sawdust or shavings in this way for many years report that soil health and crop yields have improved.

An experiment was made some years ago by a vegetable grower in Pennsylvania, who leased a large acreage of typical scrub Oak forest. Fire had occurred repeatedly, the soil was a sandy loam, recognized as droughty. Removing only large stumps and scattered Pitch Pine stems exceeding 3 in. in diameter, the operator disked and ploughed all woody material directly into the soil. Analyses indicated a soil organic content of about 10%. With a ½ ton/acre dressing of 4–8–6 fertilizer each year, this land has returned excellent yields of beans and two crops of spinach. A neighbour who observed these results, has ploughed several hundred acres of scrub Oak; his soil tests indicated that more than 8% organic matter had been incorporated in the soil. Application of ½ ton of lime and 500 lb. of $CaCN_2$ gave a good crop of potatoes, and in the following year ½ ton of 5–10–10 was applied and produced another good crop of potatoes. Standard equipment was used—a 2-row planter and unmodified

digger. Another unpublished report deals with application of Fir sawdust as a mulch in a Pear orchard on a heavy soil. A yearly dressing of 3 in. of sawdust and disking under with a cover crop of rye and a legume resulted in fine yields, good water penetration and the saving of irrigation. Soil experts checked the soil structure and found a great improvement in tilth, which increased with the age of the treatment. Fertilizer was used at the rate of 200 lb. of N in 3 applications and 100 lb. of P_2O_5 in the autumn to stimulate the legume cover crop.

It is suggested that farmers might usefully install light portable wood chippers for converting small tops, polewood-logging debris, and woodlot thinnings into chips for use as bedding or soil improver.

[1980]. 33.1 : 34.6 : 33.8. SANDS, W. M. **Interplant exchange of factory waste.** *Wood Prod.* 53 (10), 1948 (16–8).

Suggests methods by which the waste from various types of woodworking plant could be diverted to other plants requiring low-dimension stock for specialized purposes such as the production of tool handles, toys, novelties.

[1981]. 33.1 : 34.6 : 33.8. SANDS, W. M. **The trailer industry as a potential cut-stock market.** *Wood. Prod.* 53 (9), 1948 (19–20).

Gives a brief review of the trailer-building industry in the U.S.A., and suggests that, since a high % of the construction items are of small dimensions (examples are given) these could well be produced as cut-stock or prefabricated items from lower grades of wood and waste timber.

33.12. Joinery, Turnery, Wood Bending

See also *For. Abstr.* 10 (No. 2070).

[1982]. 33.12 : 07.7. HAYCOCK, A. H. **Principles of machine woodworking; the spindle moulder; the French spindle; slotted collars.** *Wood* 13 (9–11), 1948 (261–4; 293–5; 322–5).

[1983]. 33.12 : 07.7 : 01.4 : 33.15. STEVENS, W. C., and TURNER, N. **Solid and laminated wood bending.** H.M. Stationery Office, London. 1948. pp. viii + 71 + 26 photos. [Forest Products Research Laboratory, Princes Risborough.] Price 5*s*.

A comprehensive study of various processes and the theory of wood bending, divided into 2 sections: (1) Solid bending, with chapters on—the selection and preparation of bending material; softening treatments; hand bending; machine bending; and the setting of bends. (2) Laminated bending, with chapters on—the process of laminated bending; pressing laminae to shape; glue setting; the movement and distortion of laminated bends; and theoretical considerations. There are numerous illustrations.

[1984]. 33.12 : 01.4 : 33.8. Holzformung. **[Wood bending.]** *Repr.* from *Bericht, Institut für Flugzeugbau an der Technischen Hochschule, Braunschweig* No. 44–08 [*n.d.*], (358–97). 7 refs. [G.] P.R.

Contains sections on: theoretical considerations; solid wood bending with and without pre-treatment of the wood; bending of compressed wood; plywood bending; simultaneous gluing and pressing to shape of laminae; and methods and machinery. The emphasis throughout is on the bending of materials for use in aircraft. There are tables showing limiting radii of safety and of failure of different species for solid wood and laminae, graphs illustrating the effect of such variables as the method of pre-treatment and of bending and the thickness of the material, and photographs of types of machine mentioned in the text.

33.13. Cooperage. Shingles

See also *For. Abstr.* 10 (No. 2141).

[1985]. 33.13 (213). NORMAND, D. Les tuiles en bois tropical. **[Roofing shingles from tropical timbers.]** *Rev. int. Prod. colon.* 23 (227/228), 1948 (154–6, 160). 8 refs. [F.]

A brief review of the literature and of the methods of manufacture and species used in the West Indies and elsewhere in the tropics.

[1986]. 33.13 : 31.41 : 12.26–8. **[Durability of *Markhamia platycalyx* shingles.]** *Rep. For. Dep. Uganda 1947*, 1948 (18).

A sample roof of sawn shingles of *Markhamia platycalyx* was laid at Entebbe towards the end of 1946. The shingles, which were cut from plantation-grown poles, were not treated with preservative. They have so far stood up very satisfactorily, and apart from the slight buckling of an occasional shingle, seem not to have

deteriorated. Only one shingle had been attacked by borer at the end of a year.

33.14. Match Manufacture

See also *For. Abstr.* 10 (No. 1992).

[1987]. 33.14 (436). KEIDEL, B. Beitrag zur Untersuchung zeitgemässer Verwertung des Rohstoffes Holz. **[On the current use of wood as a raw material.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (13/14), 1948 (113). [G.]

Points out that the Austrian match industry uses annually some 20,000 cu.m. of high-grade timber (Spruce, Beech, Poplar and Willow) for a purpose that might well be served by cardboard made from low-grade wood produced on a short rotation.

[1988]. 33.14 : 07.7. AKTIEBOLAGET SIEFVERT AND FORNANDER. **Improved method of and machine for cutting match splints or the like.** *Brit. Patent* No. 604,057, 1948. pp. 2 + 1 dgm. P.R.

33.15. Manufacture and Use of Veneers and Laminated Wood. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

See also *For. Abstr.* 10 (Nos. 1865, 1983–4, 2070, 2085, 2090, 2133, 2143).

[1989]. 33.15. NICHOLS, W. **Sandwich construction.** *Timb. & Plywd.* 94 (2435–44), 1948 (387, 389; 425, 427; 465, 467; 503; 541, 543; 579, 581; 621, 623; 626, 659; 661, 663; 697; 735, 737, 739). P.R.

Contains sections on: general considerations; properties and characteristics of core materials; characteristics of plywood faces; glues and gluing methods; fabrication notes; and design data and test results.

[1990]. 33.15 : 31.27 : 33.8. PANEK, E., and HEEBINK, B. G. **Repair of aircraft sandwich constructions.** *Rep. U.S. For. Prod. Lab., Madison* No. 1584, 1948. pp. 11 + 10 photos, 8 dgms., 4 tbls. P.R.

Describes methods evolved for repairing faces and cores of flat sandwich panels of different materials, including plywood facings and Balsa cores, and gives the results of strength tests on each type of repair, indicating points of failure in each case.

33.15.1. *Manufacture of Veneers and Laminated Wood*

[1991]. 33.15.1 (82) : 98.3 : 09.4 : 35. LELLA, E. F. DI. La industria de maderas compensadas en la República Argentina. **[The laminated wood industry in the Argentine Republic.]** *Publ. tec. Direcc. for. Argent.* No. 10, 1947. pp. 95. 17 refs. [Span.span.] P.R.

Gives statistics for Argentine imports and exports of plywood, with a short history of the Argentine industry and a list of native and exotic species used, and describes methods of veneer cutting, seasoning and gluing. A plan for the suggested lay-out of a plywood plant is included, with data on the cost of producing plywood from Guatambú Blanco (*Balfourodendron riedelianum*).

[1992]. 33.15.1 : 12.26–8 : 33.36.3 : 31.8 : 33.14 : 31.2. **Veneer.** *Rep. For. Prod. Aust. 1947–8*, 1948 (9, 34–5, 44–5).

Some facts emerging from a study of the seasoning characteristics of veneers from the 'Ash'-type Eucalypts of southeastern Victoria are:—(1) most seasoning degrade develops before the moisture content falls to 50%; (2) face checking develops from checks occurring primarily on the 'tight' side of the veneer; (3) the use of a chemical dip (saturated NaCl solution) of 10 seconds is of advantage; and (4) reconditioning helps to reduce buckling.

Collapse of *Eucalyptus regnans* veneer in drying seems to occur mainly on the 'tight' side of the veneer, usually in the zone between the early wood and late wood of any one growth ring. No structural reason for this has been discovered.

Investigations were made on the suitability of *Pinus caribaea* and *P. taeda* (young thinnings from plantations) for plywood manufacture. Although both species could be rotary cut and dried without difficulty, 3-ply panels made from $\frac{1}{16}$-in. veneer warped badly, probably because of differential shrinkage in late and early wood. Preliminary tests indicate that warping may be eliminated by multi-ply construction. New Guinea Klinki Pine [*Araucaria klinkii*] has proved suitable for match manufacture. Studies have been continued on 'Ash'-type Eucalypts for veneers and investigations made on temperature distribution in the log when heated before rotary cutting. [Cf. *For. Abstr.* 9 (No. 2357).]

[1993]. 33.15.1. PERRY, T. D. **Paper faced veneer.** *Wood Prod.* 53 (10), 1948 (38, 40, 42–3).

[1994]. 33.15.1. PERRY, T. D. **Paper-faced plywood.** *Wood Prod.* 53 (9), 1948 (39–43).

[1995]. 33.15.1 : 07.7. OKRETIC, B., and COLLARDET, J. La machine américaine dans la fabrication des panneaux contreplaqués. [**American machinery for the manufacture of plywood.**] *Bois For. Trop.* 7 (3), 1948 (296–304). [F.]

Includes a list of names and addresses of the principal American manufacturers of machinery for the manufacture of plywood.

[1996]. 33.15.1 : 12.26–8. WANGAARD, F. F., and POLETIKA, N. V. **Laminated Connecticut Red Oak.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 22, 1948 (21–36). 13 refs. T.D.A.

A preliminary report, with tables, is made on the yield of material suitable for laminating obtained from representative trees of Red Oak species. Some of the influences of density, growth-ring placement and thickness of laminations upon strength properties and other characteristics of laminated products are discussed. The strength of laminated beams composed of laminations of different densities appears to correspond rather closely to estimates of strength based on theoretical grounds. Combinations of Red Oak of high or low density appear to be equivalent to combinations of uniform density throughout in resistance to delamination on exposure to wide variations of moisture content. The difference in shrinkage values between quarter- and plain-sawn stock is enough to justify segregation of the two when selecting stock for a laminated member to be exposed to widely varying moisture conditions. *From authors' summary.*

[1997]. 33.15.1 : 33.91. DIETZ, A. G. H. **High-grade and low-grade lumber in glued laminated members.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 22, 1948 (37–44). 5 refs. T.D.A.

The possibilities of using a combination of low-grade lumber with a relatively small amount of stronger, heavier material are discussed and equations for cost are evolved.

33.15.2. *Use, Strength and Durability of Plywood and other Laminated Wood*

See also *For. Abstr.* 10 (Nos. 1869–70, 2120–7, 2133–5, 2199).

[1998]. 33.15.2 : 31.21.4. SABINE, P. E., and RAMER, L. G. **Absorption-frequency characteristics of plywood panels.** *Repr.* from *Journal, Acoustical Society of America* 20 (3), 1948 (267–70). [Riverbank Laboratories, Geneva, Illinois.] P.R.

This paper gives, graphically, the results of measurements of the absorption co-efficients of panels made from Birch plywood, using the standardized test procedure of the Acoustical Materials Association. Effects of thickness of the plywood, of the air space behind the panels, and of absorbent backing were investigated. Measurements were also made on splayed assemblies of panels placed vertically against the wall of the reverberation chamber. The measurements show that panels of the type investigated afford an easy means of varying the absorption-frequency characteristics of rooms of moderate size. *From authors' summary.*

[1999]. 33.15.2 : 07.2 : 01.4 : 31.27. RUDKIN, A. W. **Critical review of plywood testing methods. Progress report No. 3. Experiment V.G. 9–8–Y–3. Frequency distribution of glue shear failing loads.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1948. pp. 13 + 1 gph., 6 tbls. P.R.

[2000]. 33.15.2 : 31.2. **Some properties of paper-overlaid veneer and plywood.** *Technical Paper, Housing and Home Finance Agency, U.S.A.* No. 9, 1948. pp. 26. P.R.

Paper-overlays impregnated with phenolic resin, used to mask defects in veneer and plywood, were found by tests carried out at Madison to improve bending strength, stiffness, abrasion resistance and dimensional stability of veneer. The effects of resin treatment were particularly noticeable in tests where specimens were in a water-soaked condition. For most properties, 15% resin content of the overlay gave optimum improvement. The tests are described in detail and the results expressed in graphs. *From author's summary.*

[2001]. 33.15.2 : 31.2 : 12.26–8. VINTILĂ, E. Cercetări fizico-mecanice asupra placajelor de anin incleiate cu tego-film. [**Physico-mechanical tests on plywood of Alder**

glued with Tegofilm.] *Rev. Pădurilor* 63 (4), 1948 (127–32). 10 refs. [Rum.f.]

Tests were made of the density, shrinkage, and tensile strength of plywood made of Alder (*Alnus glutinosa*) veneer glued with Tegofilm. Test specimens were of 10 different sort of plywood (1·1–2·5 mm., and both 3 and 5 plies). The following results were obtained:—(1) Total shrinkage parallel to the surface of the plywood varied between 0·1 and 0·8% (average 0·5%). (2) Shrinkage in the direction of the thickness of the plywood varied between 8 and 12·7% (average 9·7%). (3) Density at maximum volume was 0·458–0·624, and density at minimum volume 0·506–0·710 g./c.c. (4) The mean value of tensile resistance parallel to the fibres was 518, and perpendicular to the fibres, 481 kg./sq. cm.

The data obtained for shrinkage and density are compared with similar data for solid wood and veneer of the same species.

[2002]. 33.15.2 : 31.46 : 33.15.5. STERN, E. G. **Cross-laminated Oak.** *Trans. Amer. Soc. mech. Engrs.* 70 (2), 1948 (123–33). 5 refs. P.R.

Cf. *For. Abstr.* 9 (No. 2367).

33.15.3. *Improved Woods*

[2003]. 33.15.3 : 31.22.2. THUNELL, B., and ELKEN, E. Värmebehandling av trä för minskning av svällning och krympning. **[Heat treatment of wood to reduce swelling and shrinking.]** *Medd. svenska TräforsknInst.* (*Trätekn. Avd.*). No. 18, 1948. pp. 23. 33 refs. [Sw.sw.e.] P.R.

Specimens of Pine (heartwood and sapwood), Spruce, Oak (heartwood), Beech and Birch were subjected to various treatments, viz. (1) hot air, (2) water vapour, (3) nitrogen, (4) molten tin or (5) lead baths in N vapour. The results of subsequent tests are given in graphs. In all cases except (2) swelling and hygroscopicity were reduced; so was compressive strength parallel to the grain, but not so seriously as to affect utility of the wood in most cases. Nitrogen was found to be the best medium; tin gave similar results but was more expensive and more difficult to handle. Nitrogen had less effect than tin on compressive strength. Specimens treated in water vapour showed no permanent increase in dimensional stability.

[2004]. 33.15.3 : 31.27 : 31.22.2. THUNELL, B., and HONGSLO, A. Plasticering av trä. **[Plasticizing wood.]** *Medd. Svenska TräforsknInst.* (*Trätekn. Avd.*). No. 17, 1948. pp. 7. 4 refs. [Sw.sw.] P.R.

Specimens of woods of native species (Oak, Ash, Beech, Birch and Pine) were impregnated with urea-formaldehyde solution, in different proportions, and subjected, with untreated controls, to tests of elasticity, bending strength, compressive strength, shock resistance, water absorption and swelling. The results are tabulated and the following conclusions are drawn: (1) elasticity was increased in Oak and Birch (the only specimens tested) by impregnation; (2) compressive strength was increased in all 5 species, the increase ranging from 70% for Birch to 20–30% for Ash and Pine; (3) bending strength was increased by 20% for treated Oak, very slightly increased for Birch and Beech, and decreased for Ash and Pine; (4) shock resistance was decreased in all 5 species, decreasing to as much as 50% of that of the untreated wood; as far as strength properties are concerned Birch is the most and Ash and Pine are the least suitable for treatment; (5) water absorption and swelling were in all cases decreased by impregnation.

[2005]. 33.15.3. SMITHFIELD and ARGENTINE MEAT CO., LTD., and BREWSTER, J. A. **Hardening and conditioning wood.** *Brit. Patent* No. 596,801, August 4, 1945. *Brit. Abstr.* B.I., July, 1948 (318). P.R.

The wood is completely impregnated with blood under pressure and the blood is then coagulated by heat. Superimposed pieces of partly dried, blood-impregnated wood may be coherently laminated by heating under pressure.

[2006]. 33.15.3 : 33.8. **[Improved wood.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (58–9).

Compregnated boards of *Bombax malabaricum*, *Boswellia serrata* and *Cedrela toona* were made, using Tego film as a bonding agent. Compreg fish plates, installed on a railway track, were still in good condition a year later. Favourable reports were also received on a compregnated-wood bush fitted to a Port of Cochin motor launch; after 6 months' service the laminations were intact, and the Port authority has asked for more bushes of the same material. Compregnated wood has also proved a satisfactory substitute for red fibre in

regulator terminals by an electrical firm in Amritsar.

[2007]. 33.15.3 : 31.22. **[Moisture absorption and swelling behaviour of Jablo and Hydulignum.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (45–6).

Tests were made on small specimens from Jablo (casein-bonded compregnated wood) and Hydulignum (urea-resin-bonded compregnated wood) propeller blades, to find out the probable cause of failure of laminations in actual use. The test specimens showed a moisture absorption of 9–10% and a swelling of 10–13% when transferred from the constant-humidity chamber kept at 40% relative humidity to one having 94% relative humidity and kept there for about 2 weeks. There was also failure along glue lines on exposure to high-humidity atmosphere.

33.15.4. *Laminated Materials other than Wood*

See also *For. Abstr.* 10 (No. 2065).

[2008]. 33.15.4. **Plywood from maize ears.** *Woodwkg. Industr.* 5 (8), 1948 (553–4). P.R.

A new process for the manufacture of laminated material using a core of sliced maize ears and facings of veneer is described, and the results of strength tests carried out at the Scientific and Research Institute, Prague, are tabulated. It is claimed that the material has good insulating properties against sound and heat, and exceptional resistance to water, steam, frost, heat and humidity. It is also cheap and light and uses very little wood.

33.15.5. *Glues and Gluing*

[2009]. 33.15.5. **Cold-setting casein glue for wood.** *Brit. Stand.* No. 1444, 1948. pp. 11. P.R.

[2010]. 33.15.5 : 33.15.2 : 31.8. **[Veneer and gluing.]** *Rep. For. Prod. Aust. 1947–8*, 1948 (46–50).

The properties of wet-mix casein glue with reduced proportions of Na salts were investigated and some deterioration in water resistance was indicated. Cold-mixed potato-starch/casein blends produced adhesives satisfactory in most respects, but of fairly low water resistance. Peanut residues gave unsatisfactory adhesives alone, but fairly good results in combination with casein. Reaction products of lignin and furfural showed promise when the condensation was carried out under alkaline conditions, and some bonds had a high water resistance. Best results came from hot-press bonding. The viscosity of dilute potato-starch pastes can be reduced by the addition of small amounts of salts. A study of the effects of micro-organisms on the breakdown of glues showed that high alkalinity prevented a deterioration over a period of 4 weeks. Results of work on the face checking of veneers were in agreement with conclusions reached at the Forest Products Research Laboratory, Princes Risborough [cf. *For. Abstr.* 9 (Nos. 1685, 2382)]. Investigations have also been made on the chemical nature of the bonds between glue and wood. [Cf. *For. Abstr.* 9 (No. 2382).]

[2011]. 33.15.5 : 33.15.1. NARAYANAMURTI, D., RANGANATHAN, V., and AGARWAL, O. P. **Studies on adhesives. Part 12. A preliminary note on cresol-formaldehyde and cresol-casein-formaldehyde-adhesives for plywood.** *Indian For. Leafl.* No. 97, 1947. pp. 8.

[2012]. 33.15.5. **Synthetic-resin glues, [a summary of information].** *Sth. Lumberm.* 177 (2220), 1948 (71–2, 74, 76, 79–80, 82, 84). [Forest Products Laboratory, Madison, Wis.]

[2013]. 33.15.5 : 31.22.1. BERGIN, E. G. **Importance of control of moisture in wood to be glued with room-temperature-setting urea-formaldehyde glues.** *Mimeo. For. Prod. Lab., Can.* No. 134, 1948. pp. 9 + 3 dgms., 5 gphs. P.R.

The moisture content of the wood to be glued influences the strength of the glue joint considerably, and should be maintained at between 7 and 12·5%. Below 7%, joint strength falls off rapidly, and above 12·5%, slightly.

[2014]. 33.15.5 : 01.4. HARRIS, G. P. **Accelerated curing of resin adhesives, [by hot air, contact heating with platens, heater strips, infra-red lamps and high frequency].** *Timb. & Plyw.* 95 (2467), 1948 (667–8, 670). P.R.

[2015]. 33.15.5 : 01.4. COUSINS, F. W. **The recent literature of high frequency**

heating as applied to wood. *Timber News* 56 (2113), 1948 (414–6).

[2016]. 33.15.5 : 01.4. EGNER, K. Heizverfahren der Kunstharzleimung in der Holztechnik: mit besonderer Berücksichtigung der Hochfrequenzerwärmung. **[Heat treatment of artificial resin glues in woodworking: with special reference to high-frequency heating.]** *Holz-Zentralblatt* 74 (53), 1948 (437–9). 6 refs. [G.] P.R.

33.17. Sawmilling

See also *For. Abstr.* 10 (Nos. 1950–1).

[2017]. 33.17 (431–5). La manutention dans les scieries allemandes. **[Sawmill management in [the French zone of] Germany.]** *Rev. Bois Appl.* 3 (11), 1948 (13–5). [F.]

[2018]. 33.17 : 12.25 : 12.26–8 (943 : 945). WRIGHT, G. W. **The sawmill study and forest management.** *Aust. For.* 12 (1), 1948 (16–26).

An account of the design and methods of mill studies of *Callitris glauca* and the 'Ash' Eucalypts in Queensland and Victoria. [Cf. *For. Abstr.* 9 (Nos. 1709, 1710).]

[2019]. 33.17 : 33.01 (71). BELL, G. E. **The effect of log diameter on lumber recovery and on lumber manufacture in Eastern Canada. Preliminary report, Type 'B' sawmills.** *Mimeo. For. Prod. Lab., Can.* No. 0–136, 1948. pp. 13 + 5 gphs.

Reviews studies on 12 sawmills with circular head-saw, edger and trim-saws, and includes tables showing the recovery of lumber from different species; the utilization of slabs, edgings, trim and sawdust and the amounts wasted; the relationship between volume of lumber and waste and the log diameter; lumber output per hr. in relation to log diameter, and effect of diameter on lumber grades.

[2020]. 33.17 : 07.7. Un nouveau matériel. **[A new implement.]** *Rev. int. Bois* 15 (134/135), 1948 (164). [F.]

A short description of the Forestière, a new portable sawmill, transported on skidding wheels which can also be used for bringing logs to the sawbench when it is set up in the woods. Driven by either a 15-h.p. electric motor or a 4-cylinder petrol engine, it will convert logs up to 1 m. in diameter and 5 m. long.

[2021]. 33.17 : 07.7. BOGGESS, W. R., and CLARK, R. H. **Carpenter dimension mill as an aid in utilization of small hardwoods.** *Rep. Ala. agric. Exp. Sta. 1945–6*, 1948 (31–2).

This mill is a modified edger that saws small logs into square-edged dimension stock, and a test sawing was made to determine its adaptability for sawing small hardwoods. It was concluded that such operations should prove reasonably profitable.

[2022]. 33.17 : 07.7 (471). Förslag till standard för ramsågblad. **[Proposals for standardizing frame-saw blades.]** *Pcpp. Trävarutidskr. Finl.* 30 (18), 1948 (321–2). [Sw.] P.R.

Gives, with diagrammatic illustrations, the standardization proposals made by a committee set up for the purpose. Proposals for the standardization of saw-teeth and of circular-saw blades will follow in due course.

[2023]. 33.17 : 07.7. **A vertical log band mill.** *Engineer, Lond.* 186 (4832), 1948 (241–4). D.S.I.R.

Describes with illustrations a new electrically-driven band mill, controlled by a single operator at a desk with a clear view of the working area. The machine is designed to handle logs up to 20 ft. long and 46 in. diameter, and with the saw guide removed can cut 1-in. planks up to 60 in. deep.

[2024]. 33.17 : 07.7. CREIGHTON, J. W. **Time study of small sawmill air dogs.** *Quart. Bull. Mich. agric. Exp. Sta.* 31 (1), 1948 (41–56). 3 refs.

The basis of this report is a time study of a sample of 498 logs, half of which were sawn using only hand dogs and the other half using compressed-air dogs [cf. *For. Abstr.* 9 (No. 1061)]. The use of air dogs saved 6·46% of total sawing time for hand-dog operations, and also greatly reduced fatigue in the operator.

[2025]. 33.17 : 07.7. **New lumber sorting device simplifies handling.** *Sth. Lumberm.* 177 (2217), 1948 (80, 82, 84).

The 'Roll-a-board' sorter consists of a series of rollers mounted beneath steel guide plates that form a group of slots. Boards are dropped into slots corresponding to their grade and size and are carried by the rollers out over a trestle to fixed points where they are deflected to

skids on which they slide to platforms, for removal to kiln trucks or to the air-seasoning yard. Sorters can be built with 4 to 30 slots. The description is illustrated.

[2026]. 33.17 : 07.7. **Improvement in drop sorters.** *Timberman* 49 (12), 1948 (80).

Describes an improved drop sorter for sawn timber, used by the Weyerhaeuser Timber Co. in Everett, Washington. Air-powered roller lift arms, controlled by a foot pedal, can be lowered to bridge breaks in the sorting table and allow timber to pass over, or can be raised to let the timber drop below, to be carried away for re-sawing, to the green chain, etc.

[2027]. 33.17 : 07.7. Lapin, P. I. Strogal'-nŷe pilŷ. **[Planing saws.]** *Lesnaya Prom.* 1948 (6), (15–18). [Arkhangel'ski lesotekh-nicheski Institut.] [Russ.]

Discusses the design (illustrated) and disadvantages of several existing Russian types of circular planing saw having either special teeth or knives, intercalated between the ordinary teeth, to do the work of planing. Describes and figures an improved design by the machines laboratory of ALTI (the Archangel Institute of Forest Technology) in which the planing is done by radial knives set on the blade between the teeth and the centre of the saw. The knives may be formed either by cutting them out of the blade itself as]-shaped incisions, bent outwards on alternate sides of the blade and set 0·2–0·3 mm. wider than the teeth, or by making detachable knives which are bolted or riveted in a corresponding position. The distance from the centre of the saw is determined by the thickness of the stuff cut and is so adjusted that, when vertically above the centre of the saw, the top of a knife projects 5 mm. from the kerf. Two to 4 or more knives may be carried on the blade. Laboratory and mill tests on both green and dried timber of Scots Pine and Norway Spruce gave satisfactory results and showed the saw to be suitable for the manufacture of boxboards, etc. Power consumption was 10–20% more than for ordinary circular sawing.

Mention is also made of similar adaptations (also illustrated) to frame-saw blades. Of several types discussed, those considered suitable are:—(1) a type designed by the Central Research Institute for Woodworking Machinery, in which]-shaped knives are cut in the blade slightly behind its mid-line, the planing action taking place on the working stroke (i.e. simultaneously with the cutting action); (2) similar designs by ALTI in which knives on or near the back of the blade are directed so as to cut on the idle stroke of the saw, thus economizing in power.

[2028]. 33.17 : 07.7. Dick, M. E. **Precision surfacing of wood [:machines and methods].** *B.C. Lumberm.* 32 (8), 1948 (76, 78). [U.S. Forest Products Research Society.]

[2029]. 33.17 : 07.7. **Electronic control of a planing machine.** *Engineering* 166 (4314), 1948 (320–1). D.S.I.R. [The General Electric Company, Limited, London.]

[2030]. 33.17 : 07.7. : 32.96. **New method loading lumber on trucks.** *W. Cst. Lumberm.* 75 (8), 1948 (80, 111).

A 'GI' International truck is fitted with a set of 4 rollers, one of which can be raised or lowered by means of brackets geared to a front-end powered winch. The truck is backed under a pile of supported timber and the operable roller lifted to raise the timber clear of the supports before lowering it on to the rollered chassis bed. The system has been developed by the Lake Fork Lumber Co., Idaho.

33.3. *Chemical Treatment*

See also *For. Abstr.* 10 (No. 1976).

[2031]. 33.3 (436). Scheuble, R. **The current position of applied wood chemistry in Austria.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O.*] *Sub-committee on Wood Chemistry, Geneva* 1948 (9–11). [Forestry Research Institute, Mariabrunn, Austria.] P.R.

Subjects discussed are pulp mills in Austria, destructive distillation, wood saccharification, production of wood-wool board and fibreboard, impregnation, and a draft law to make impregnation compulsory, and resin tapping from *Pinus nigra* var. *austriaca*, *P. sylvestris*, and *Larix decidua*. Two new methods of saccharification, and the manufacture of a heavy fibreboard, using a pressure of 600–700 kg./sq. cm. without the addition of a binder, are considered particularly interesting.

[2032]. 33.3 (44) : 07.2. Villière, C. A. **Progress of research work in the principal chemical wood industries in France.** [*Proceedings of the*] *Second Meeting of the*

[*F.A.O.*] *Sub-committee on Wood Chemistry, Geneva* 1948 (24–6). [E.] [National Wood Institute, Paris.] P.R.

The present position with regard to wood resins, charcoal burning, tannin extracts, cellulose, fibreboards, hydrolysis, utilization of wood waste, and the manufacture of *Torula* yeast for feeding livestock, is briefly reviewed. In the field of cellulose production, a cardboard produced from hardwoods by mechanical defibration after a period of steaming under pressure, is considered of particular interest, and research on the practicability of mixing species for pulp and on the utilization of tropical woods is in progress. In the field of wood-waste utilization, the manufacture of moulded objects by a new process using lignin as a binder with only a small proportion (1–2% of the weight of the wood) of non-wood products, has reached commercial scale.

[2033]. 33.3 (45) : 34.24. CENTOLA, G. **The practice of applied wood chemistry in Italy.** [*Proceedings of the*] *Second Meeting of of the* [*F.A.O.*] *Sub-committee on Wood Chemistry, Geneva* 1948 (31–3). [E.] P.R.

[2034]. 33.3 (485) : 31.3. HÄGGLUND, E. **Certain achievements in research and technical developments of wood chemistry and cellulose technology during the last years in Sweden.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O.*] *Sub-committee on Wood Chemistry, Geneva* 1948 (34–6). [E.] [Central Laboratories of the Pulp Industry, Stockholm.] P.R.

Reviews (1) research on: lignin (physical methods, especially optical investigations, and the colour reactions of wood); the chemistry of the sulphite process; the effect of sulphite cooking on the carbohydrates in wood; loosely combined sulphurous acids in sulphite waste liquor; the evaporation of waste sulphite liquor; and the sulphate process; (2) industrial developments in bleaching methods and rayon pulp.

Use of Wastes

See also *For. Abstr.* 10 (Nos. 1878–96, 2060, 2114).

[2035]. 33.3 : 34.6. BRUNES, B., SAMUELSON, O., and ULFSPARRE, S. **Some aspects of the evaporation of sulphite waste liquor.** *Svensk PappTidn.* 50 (11*b*), 1947 (29–33). 8 refs. [E.] D.S.I.R.

Discusses different methods of evaporation of sulphite waste liquor, with reference to heat consumption and the degree of incrustation of heating surfaces.

[2036]. 33.3 : 34.6. STUMPF, W. Über die Druckhydrierung von Sulfitablauge. [**The pressure hydrogenation of sulphite waste liquor.**] *Svensk PappTidn.* 50 (11*b*), 1947 (164–6). 5 refs. [Sw.] D.S.I.R.

The course of the reaction in the hydrogenation of waste liquor is found to depend on the catalyst, the time, temperature and pressure and the concentration of lignosulphonic acid and of alkali. The best catalysts are nickel, chrome, ferrochrome, etc. Results are expressed in graphs.

[2037]. 33.3 : 34.6 : 31.3. SHINN, D. L. **Electrolysis of calcium-base sulfite waste liquor.** *Pulp and Paper Industry* 19 (12), 1945 (66–8). *Chem. Abstr.* 40, 1946 (4300). P.R.

[2038]. 33.3 : 34.6 : 34.24. GUSTAVSSON, K. H., and LARSSON, A. **Investigation of the mechanism of vegetable tannage by means of lignosulfonic and aromatic sulfo acids.** *Svensk PappTidn.* 50 (11*b*), 1947 (101–8). 34 refs. [E.e.] D.S.I.R.

[2039]. 33.3 : 34.6 : 11.47.1. ARIES, R. S. **The use of lignin as a soil builder.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 19, 1948 (79–121). 57 refs. T.D.A.

A review of literature on the decomposition of plant residues, the use of sulphite waste liquor and wood waste as fertilizer, and the combination of lignin and inorganic materials; along with descriptions of experiments, the results of which are tabulated, on the use of Scholler lignin, basic Ca lignosulphate, sulphite lignin, basic Ca sulphonate and red mud, sulphite waste liquor and a Silvacon bark product as agricultural fertilizers. [See *For. Abstr.* 8 (Nos. 402, 2546; 10 (No. 421).]

[2040]. 33.3 : 34.6. HALL, H. E., and COLEMAN, L. L. (to Masonite Corp.). **Recovery of pentosans and hexosans from wood liquor.** *U.S. Patent* No. 2,444,823, July 6, 1948. *Chem. Abstr.* 42 (19), 1948 (7484–5). P.R.

33.32. Pulp and Paper Manufacture. Wallboards. Plastics

See also *For. Abstr.* 10 (Nos. 1710–1, 1878–97).

[2041]. 33.32 (803) : 98.1. **Consumption and production of paper and paperboard in the twenty Latin-American republics, 1935–46.** *Unasylva* 2 (1), 1948 (27–31).

[2042]. 33.32 : 12.25 (931). **[Pulp- and paper-making trials with New Zealand-grown *Pinus radiata*.]** *Rep. N.Z. For. Serv. 1947–8*, 1948 (51–3).

A comprehensive series of trials were carried out in co-operation with the 3 largest paper manufacturers in Australia, making use of 520 cords of *P. radiata* pulpwood, mostly from 25-year-old trees from Kaingawa State Forest. In both yield and bursting and tensile strength the sulphate pulp was found to be the equal of good Swedish pulp, but it was lower in tearing strength. Bleaching tests showed that a satisfactory sulphate pulp could be produced without excessive consumption of bleaching agents. A test was made of the manufacture of multi-wall cement bags of 5-ply construction. Tubing strength was up to standard, but sewing strength only 83% of standard. Mechanical pulping tests were also successful and satisfactory newsprint was produced from the groundwood pulp.

[2043]. 33.32 (711) : 32.7 : 33.1 : 34.6 (711). GUERNSEY, F. W. **Wood waste as a source of pulp on the Pacific Coast.** *B.C. Lumberm.* 32 (9), 1948 (66, 107–8, 110, 112). 5 refs.

A discussion of the wood-waste problem in the southern coast region of British Columbia.

33.32.1. *Pulp Manufacture*

[2044]. 33.32.1 : 07.7. MERS, C. D. DE. **Instrument application in groundwood pulp mills.** *Pulp Paper Mag. Can.* 49 (10), 1948 (96–100).

Considers some problems connected with grinders.

[2045]. 33.32.1 : 31.42.11 : 12.26–8. HYTTINEN, A., and SCHAFER, E. R. **Effect of decay on the groundwood pulping of Quaking Aspen [*Populus tremuloides*].** *Repr.* from *Paper Industry and Paper World* June, 1948. pp. 3. 3 refs. [Forest Products Laboratory, Madison.] P.R.

The experiments indicate that decay in wood materially affects the brightness and slightly affects the bursting and tearing strengths and average fibre length of the pulp, values varying in inverse proportion to the amount of decay present, but that the decay has little effect on grinding rate, energy consumption, and tensile strength. The greater proportions of decay also introduce appreciably larger amounts of dirt. *From authors' summary.*

[2046]. 33.32.1 : 31.42.1. RENNERFELT, E. Svampfloran i våt slipmassa, lagrad på olika sätt. **[Fungus flora in wet mechanical pulp stored under different conditions.]** *Svensk PappTidn.* 50 (11*b*), 1947 (141–4). 11 refs. [Sw.] D.S.I.R.

Cf. *For. Abstr.* 7 (No. 1906).

[2047]. 33.32.1 : 31.42. PEHRSON, S. O., and LINDBERG, N. J. **Control of micro-organisms in pulp and paper mills. 2. The sorption of phenylmercuric ions on fibres.** *Svensk PappTidn.* 51 (19), 1948 (439–46). 14 refs. [E.g.sw.e.] P.R.

[2048]. 33.32.1 : 07.2 : 01.4. CLARK, J. D'A. **An approach to the rational evaluation of pulp.** *Pulp Paper Mag. Can.* 49 (10), 1948 (101–9). 2 refs.

Discusses methods of testing pulp quality.

[2049]. 33.32.1 : 31.3. JAYME. G. Bestimmung und Bedeutung der Reaktionsfähigkeit von Zellstoffen. **[The estimation and significance of the reactivity of pulp.]** *Svensk PappTidn.* 50 (11*b*), 1947 (117–23). 32 refs. [G.] [Techn. Hochschule, Darmstadt, Germany.] D.S.I.R.

[2050]. 33.32.1 : 12.26–8 (746). ARIES, R. S. **The pulping of southern New England hardwoods.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 20, 1948. pp. 26. T.D.A.

Discusses the possibility of setting up locally supplied pulping mills in Connecticut, and presents data for pulping experiments on a mixture of local hardwoods, mainly *Quercus alba*, *Q. borealis*, *Acer saccharum* and *Carya* sp. The following experimental cooks were made:– (1) semi-chemical kraft process for board pulp, (2) neutral sulphite semi-chemical process for board pulp, (3) kraft process for paper pulp, and (4) neutral sulphite semi-chemical process for paper pulp. Data on digestion conditions, strength characteristics and bleaching qualities

are presented. Costs and uses of wastes are also discussed. Satisfactory corrugating board can be obtained from either (1) or (2), but the pulps from (2) are stronger and stiffer and yields are higher. Satisfactory paper pulps can be obtained by either (3) or (4) but yields from (3) are lower. With the exception of tearing strength there was little difference in strength in unbleached pulps from (3) and (4). It is concluded that the neutral sulphite semi-chemical process is perfectly feasible for southern New England hardwoods.

[2051]. 33.32.1: 33.02 : 31.22.1 : 32.82. VENEMARK, E. Sur eller torr, färsk eller lagrad ved för sulfatmassetillverkning. **[Moist or dry, fresh or seasoned wood for sulphate pulping.]** *Svensk PappTidn.* 51 (18), 1948 (418–24). 16 refs. [Sw.g.e.] P.R.

Tables are given, with discussion, showing the comparative effects on cost of: (1) storing the wood at the mill on land or in water; (2) processing the wood moist or dry. Dry wood can be processed with less use of heat, but moist wood gives better yields of tall oil and turpentine. Yields are noticeably reduced in wood that is dried before floating. On the whole, it seems best to store unbarked wood in water and process it wet. In the case of wood rich in sapwood, which must be barked before floating, the difference in cost for storing wet or dry is slight. The article recommends storing it on land and processing during the winter. The effects of moisture content and of air-drying the wood are discussed. Laboratory tests, which are not, however, considered sufficient, indicate higher yield and strength properties in pulp from wood processed moist and fresh. The need for further large-scale experiments is emphasized.

[2052]. 33.32.1 (51) : 12.25 : 31.3. CHANG, Y. H., CHANG, C. N., and LI, C. C. **Raw materials used in Chinese papermaking. III. Soda- and sulphate-pulping of Chinese Fir and Cedar.** *Bulletin, National Bureau of Industrial Research, China* No. 112, 1941. *Brit. Abstr.* BII, Nov., 1946 (415). P.R.

Results of analysis (% of dry weight) of wood of *Cunninghamia lanceolata* (Fir) and *Cupressus funebris* (Cedar), respectively, are: moisture 10·70, 10·28; ash 0·24, 0·24; matter extractable with cold water 3·08, 3·42, hot water 6·02, 4·56, Et_2O 0·45, 2·43, and 1% NaOH 16·70, 17·07; pectin 1·02, 1·10; AcOH 1·81, 1·75; protein 0·78, 0·89; pentosan 11·65, 10·69; cellulose 46·11, 44·16; lignin 32·67, 32·44; galactan 1·21, 0·73; and mannosan 4·45, 4·20. Pulping tests were carried out in an autoclave at 120–130 lb. sq. in. for an effective digestion period of 6 hr. (total digestion period 6·5 hr.) at 172–5° C. The weight of raw materials used in each test was 30 g. and the total amount of alkali solution 180 and 120 ml. respectively. The alkali used (Na_2O per 100 parts of dry raw material) varied from 30 to 46. (The alkali solution for sulphate pulping was a 3 : 1 mixture of NaOH and Na_2S). Results are: (1) soda pulping: with Fir 37·9% alkali gave complete digestion and a yield of 39·45%, while with Cedar 37·8% alkali solution gave similar results but the yield was 37·50%. (2) Sulphate pulping: with Fir 37·9% alkali yielded 39·13% with complete digestion, and with Cedar 40·0% alkali gave similarly a yield of 38·84%. In both processes the yield was increased by decreasing the amount of alkali used, but under these conditions digestion is incomplete and the fibres are not separated in good condition.

[2053]. 33.32.1 : 31.1 : 12.25. HEINIG, M., and SIMMONDS, F. A. **Length and width of unbleached sulphate pulp fibers from certain western woods.** *Repr.* from *Paper Industry and Paper World* August, 1948. pp. 4. 8 refs. [Forest Products Laboratory, Madison.] P.R.

Fibre measurements were made on unbeaten, unbleached pulps from Douglas Fir (*Pseudotsuga taxifolia*), Western Hemlock (*Tsuga heterophylla*), Pacific Silver Fir (*Abies amabilis*) and Western Red Cedar (*Thuja plicata*). The arithmetic-mean lengths and widths of the whole fibres were found to differ slightly according to species. A comparison of the weighted-average fibre-length values of all fibrous materials (i.e. whole fibres, fibre pieces and ray cells) in the pulps showed them to be essentially the same for all species. The length distribution both of whole fibres only and of all fibrous material showed a higher proportion of very long fibres in Douglas Fir than in the other pulps.

[2054]. 33.32.1 : 01.4. MCGOVERN, J. N. **Some experiments in sodium sulphite pulping.** *Pulp Paper Mag. Can.* 49 (9), 1948 (93–100). 20 refs.

Presents the results of experiments made at Madison on sodium sulphite pulping. Black

Spruce (*Picea mariana*) pulped with Na_2SO_3 buffered with Na_2S gave 15% lower yield than when pulped by the acid sulphite or sulphate processes, but the pulp was nearly as bright as the acid sulphite pulps and was as strong as or stronger than the sulphate pulps. More chemical and much longer pulping time was needed for the sodium sulphite than for the sulphate process. Similar results were obtained with White Spruce (*Picea glauca*), Engelmann Spruce (*P. engelmannii*), and Balsam Fir (*Abies balsamea*). With Aspen (*Populus tremuloides*) and Black Maple (*Acer nigrum*) higher yields and brighter but much weaker pulps were obtained. The hardwood sodium sulphite pulps, however, after some beater processing, compared favourably in strength with softwood acid sulphite pulp. Jack Pine (*Pinus banksiana*), pulped with Na_2SO_3 buffered with Na_2S, gave yields varying from 48 to 78%, the highest strength properties (except for folding endurance) being found in pulps made in yields of 55 to 60%. A high-yield (56·5%) sulphate pulp from the same chips had the same strength values as the neutral sodium sulphite pulp made in the same yield, except for folding endurance, which was twice as high for the sulphate pulp. *From author's summary.*

[2055]. 33.32.1 : 01.4. RICHTER, J. Jatkuva selluloosakeitto. **[The continuous digestion of wood-pulp.]** *Papp. Travarutidskr. Finl.* 30 (15; 16), 1948 (257–60; 269–72, 275). [Fi.] P.R.

[2056]. 33.32.1 : 31.3 : 12.26–8. MARCH, R. E. **The effect on pulp quality of the stepwise removal and replacement of the hemicelluloses from Aspen holocellulose.** *Paper Tr. J.* 127 (17), 1948 (51–7). 28 refs. P.R.

Pulps from Aspen holocellulose extracted with KOH showed in general greater bursting strength and lower tearing resistance than a bleached Aspen kraft pulp. The re-addition of small quantities of hemicellulose to the fibrous residues increased bursting strength slightly, but addition of large quantities did not improve pulp strength.

[2057]. 33.32.1 : 31.3. BERGEK, T., GUSTAVSSON, S., and LINDVALL, E. **Hot refining of cellulose.** *Svensk PappTidn.* 50 (11*b*), 1947 (22–8). 29 refs. [E.] D.S.I.R.

Experiments show: (1) that dissolution of pulp during hot refining presupposes a reaction between part of the cellulose and alkali or within the cellulose chains in the alkaline milieu, the carbonyl groups of the cellulose playing an important part in these reactions; and (2) that reaction takes place first in those parts of the fibrous wall where the packing density of the molecules is lowest. It is not clear which reaction plays the leading part in the hot refining process. Results of the experiments are expressed in graphs and tables.

[2058]. 33.32.1. FERGUSON, R. R. **Some recent advances in the zinc hydrosulphite bleaching of groundwood.** *B.C. Lumberm.* 32 (8), 1948 (60–1, 78, 80).

[2059]. 33.32.1. GIERTZ, W. H. En bedömningsgrund för sulfitmassors blekbarhet. **[A basis for estimating the bleachability of sulphite pulp.]** *Svensk PappTidn.* 50 (11*b*), 1947 (94–5). 2 refs. [Sw.] [Svenska Träforskningsinstitutet, Göteborg.] D.S.I.R.

33.32.3. *Wallboards, Fibreboards, etc.*

See also *For. Abstr.* 10 (No. 2070).

[2060]. 33.32.3 : 33.1 : 34.6 : 33.3. **Small scale manufacture of insulating boards from wood waste.** *Technical Bulletin, Housing and Home Finance Agency, U.S.A.* No. 5, 1948 (39–61). P.R.

Tests were carried out at Madison on the use for insulating boards of such wastes as sawdust and solid wood wastes from sawmills; pulpmill wastes consisting of a mixture of bark, chipper sawdust, and chip and pulp screenings; and low-density hardwoods, such as Aspen, available as thinnings and as sawmill waste. Boards made from sawmill waste were subjected to standard tests of strength, water absorption and permeability, and linear expansion. Test sheets from pulps of Aspen thinnings were in certain conditions comparable in freeness, strength and density with sheets of Western Hemlock, a pulp known to be suitable for manufacture of insulating board. All pulps made from pulpmill waste were very weak; that from sodium sulphite digestion was slightly stronger, and might be used for roof insulating boards, but the yields were below expectation. All results are tabulated.

[2061]. 33.32.3 : 33.1 : 34.6. **Production of compressed sawdust board.** *Engineer, Lond.* 186 (4835), 1948 (319). D.S.I.R.

Sawdust and resin are mixed and stored in an overhead hopper. The mixture passes down a chute on to a moving belt of paper on which it is spread to an even thickness. It is then carried through a chamber where the resin is plasticized by radio-frequency waves. A 2nd sheet of paper is fed on to the mixture, which is then subjected to pressure and heat between platens. The continuous strip of hard board which emerges, travels along a table and is cut into lengths by a circular saw. The properties of the board can be varied by varying the amount and type of resin and sawdust.

[2062]. 33.32.3. **'Rubberwood'.** *Timb. & Plyw.* 95 (2451), 1948 (24). P.R.

'Rubberwood' is a new sheet material made from chemically treated wood dusts, bonded by heat and pressure with a minimum amount of synthetic resin. It has the specific gravity of ordinary hardboard, and the use of only a small amount of resin means that it can be worked with ordinary tools without undue wear or blunting.

[2063]. 33.32.3 : 33.1 : 34.6. **Building materials.** *Rep. For. Prod. Aust. 1947–8*, 1948 (34).

Preliminary results from work on a sawdust/synthetic-resin building board indicate that a finely ground resin is desirable, a coarse one producing a variable board of low strength. The strongest boards made had a modulus of rupture of 6,500 lb./sq. in. and were made from a coarse sawdust and fine resin. A resin concentration as low as 10% is thought to be satisfactory.

[2064]. 33.32.3 : 12.25 : 12.26–8. McGovern, J. N., Mackin, G. E., and Chidester, G. H. **Linerboards from Jack Pine and hardwood semichemical pulps.** *Fibre Contain.* 33 (10), 1948 (35–6, 38, 40, 45–6, 48, 50, 52). P.R.

Describes and tabulates the results of experiments on: (1) the properties of Jack Pine sulphate and neutral sulphite pulps compared with those of neutral sulphite pulps made from Quaking Aspen (*Populus tremuloides*), Paper Birch (*Betula papyrifera*), Eucalyptus (*E. gigantea*) and a mixture of Beech (*Fagus grandifolia*), Cherry (*Prunus serotina*) and Maple (*Acer saccharum*); (2) the effect of blending Jack Pine with neutral sulphite semichemical and Southern Pine sulphate pulps; (3) the properties of linerboards made from the various pulps compared with those of commercial southern kraft linerboard; and (4) those of different combinations of boards in combined container board. Results show that (1) a linerboard adequate for commercial specifications can be made from Jack Pine neutral sulphite pulp and mixtures of Jack Pine and Aspen pulps; (2) boards made from the hardwoods listed above approach Southern Pine linerboard in bursting strength, are equal or higher in tensile strength, considerably lower in tearing strength and folding endurance, and have higher stiffness values.

[2065]. 33.32.3 : 33.15.4. **An experimental investigation of prefabricated house construction using K-veneer. Final report, K-veneer house project.** Elmendorf Corporation, Chicago. 1948. pp. 81. *Abstr.* in *Bibliogr. sci. industr. Rep.* 9 (7), 1948 (579). D.S.I.R.

K-veneer is a wallboard made of a single layer of thick veneer faced on one side with heavy kraft linerboard. The report covers test procedures and results of tests made on types of K-veneer suitable for house use and on wall and roof panels, laboratory equipment and machinery for commercial production. An appendix lists available drawings prepared under the project, which illustrate the suggested methods developed for the use of K-veneer in prefabricated houses, and includes reduced-scale reproductions and suggested specifications.

[2066]. 33.32.3 : 12.29. **[Betel-nut husk board.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (59).

Several types of insulation and hard board were prepared, with encouraging results. In preliminary tests, tensile strengths of about 5,000 lb./sq. in. and bending strengths of over 13,000 lb./sq. in. were obtained.

[2067]. 33.32.3. Pearson, R. G., and Schuster, K. **The bending of Masonite.** *For. Prod. News-Lett. C.S.I.R.* No. 165, 1948 (4).

[2068]. 33.32.3 : 31.22.2. Ögland, N. J. **Hårda träfiberskivors svällning och krympning.**

I. **[The swelling and shrinkage of wood-fibre hardboards.]** *Svensk PappTidn.* 51 (16), 1948 (357–60). 5 refs. [Sw.g.e.] P.R.

The amount of swelling and shrinkage in fibreboards will be influenced by the arrangement of the fibres and bunches of fibres in relation to the plane surface of the board. Generally the fibres fall into the same plane as the board, but not in any constant direction within the plane. Experiments showed that swelling and shrinkage were greater in the thickness of the board than in other directions. When a wet board dries, part of the swelling of the thickness is retained; in length, however, the board contracts on drying to below its original measurement. Data from experiments on water absorption during brief immersion give no information on swelling conditions in moist air.

[2069]. 33.32.3 : 31.22.3. ROWLEY, F. B., and LUND, C. E. **Vapor transmission analysis of structural insulating board.** *Bulletin, Minnesota Engineering Experiment Station* No. 22, 1944. pp. 71. D.S.I.R.

Discusses the theory of the diffusion of water vapour through materials, and, in the case of diffusion through insulating boards, its relation to condensation. Concludes, as the result of experiment, that insulating boards may be used in very humid conditions if adequate vapour barriers (in the form of paint, varnish, or wall covering) are incorporated on the warm side of the wall.

33.32.4. *Plastics*

[2070]. 33.32.4 : 33.31 : 33.12 : 33.15 : 33.32.3. LESSER, M. A. **A discussion of the plasticizing action of glycerine for the proper conditioning of wood.** *Wood Prod.* 53 (9), 1948 (35–7).

Deals with the uses of glycerine in compounds for stabilizing and plasticizing veneers, in wood-working glues, in ornamental moulding compositions and other plastics, in building slabs, and in coatings and finishes for wallboards and other wood products.

33.36. Wood Finishes. Preservation of Wood. Seasoning and Drying

[2071]. 33.36 : 31.2. BROWNE, F. L. **Behavior of house paints on different woods.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1053 (rev.), 1948. pp. 18 + 6 photos, 1 dgm., 2 gphs., 6 tbls. 19 refs. P.R.

See *For. Abstr.* 9 (No. 2419).

[2072]. 33.36 : 12.26–8 : 31.22.1. **[Effects of painting and priming on the equilibrium moisture content of Rimu (*Dacrydium cupressinum*).]** *Rep. N.Z. For. Serv. 1947–8*, 1948 (48).

[2073]. 33.36 : 05.3 : 01.6. KINBERG, W. Jahresbericht 1947 über Holzschutz gegen Holzpilze, tierische Schädlinge und Feuer. **[Annual report for 1947 on the protection of wood from decay, harmful animals and fire.]** Willy Kinberg, Stockholm-Vendelsö. 1948. pp. 103. 478 refs. [G.E.]

Reviews the world literature for 1947 under various heads. There are also a list of references cited, a list of authors, and a subject index.

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 10 (Nos. 1918, 1953–5).

[2074]. 33.36.1 : 33.31 : 01.2. **Nomenclature and definitions of wood preservatives and wood coatings [adopted by the U.S. National Door Manufacturers Association, Chicago, February, 1948].** *Wood Prod.* 53 (10), 1948 (35–6).

[2075]. 33.36.1 : 33.31. ALLIOT, M. H. L'industrie chimique au service de la protection du bois. **[The chemical industry and wood preservation [:the use of phenol preservatives].]** *Rev. Bois Appl.* 3 (3), 1948 (26–8). [F.]

[2076]. 33.36.1 : 01.4. GIESEKING, E. Das Osmose-Holzschutzverfahren und die Osmol-Pastetechnik. **[The Osmose process of wood preservation, and the Osmol paste method.]** *Repr.* from *Holz, Augsburg* June, 1948 (11–4). [G.] P.R.

[2077]. 33.36.1 : 01.4. BÖHRINGER, W. Holzschutz durch Nachimpregnierung. **[Preservation of wood by reimpregnation.]** *Glückauf* 81/4 (3/4), 1948 (58–60). [G.] D.S.I.R.

Describes the Osmose process, adapted for the retreatment after a lapse of time of areas particularly threatened by decay. Re-impregnation methods are not a substitute for impregnation before use.

[2078]. 33.36.1 : 33.31 : 07.2 : 31.42.11. BAVENDAMM, W. Die pilzwidrige Wirkung der im Holzschutz benutzten Chemikalien. [**The fungicidal effect of chemicals used in wood preservation.**] *Mitt. Reichsinst. Forst- u. Holzw., Hamburg* No. 7, 1948. pp. 14. 48 refs. [G.g.e.f.span.]

In 3 years of experiment, the fungicidal effects of 11 chemical compounds commonly used in wood preservation were tested for efficiency before and after leaching. Results are tabulated and lists given of the chemicals in order of their efficiency before leaching and their resistance to leaching. Fungi recommended for use in efficiency tests are *Polyporus vaporarius, Lenzites abietina, Polystictus versicolor* and *Coniophora cerebella*, with the addition of *Lentinus squamosus* when oily preservatives are being tested.

[2079]. 33.36.1 : 33.31 : 07.2 : 31.43 : 13.2. BECKER, G., and SCHULZE, B. Zur Prüfung der vorbeugenden Wirkung von Holzschutzmitteln gegen Insekten. [**On testing the preventive effect of wood preservatives against insects.**] *Mitt. Reichsinst. Forst- u. Holzw., Hamburg* No. 6, 1948. pp. 12. 24 refs. [G.g.e.f.span.] P.R.

A standard method of testing insecticides (German Standard DIN 52621) was taken as the basis for a series of experiments and is described in detail. Results of experiments on the effects of: (1) the direction of penetration into the wood, (2) the concentration of the insecticides, (3) the number of applications, (4) the duration of the test, (5) the period elapsing between applications, (6) the temperature at the time of test, (7) the preservative used (5 classes recognized—simple chemical compounds, commercial preservatives intended for use against *Hylotrupes bajulus*, commercial combined insecticides and fungicides, commercial fungicides, and commercial fire-proofing agents), and (8) the 'delayed action effect' of preservatives, are discussed and tabulated.

[2080]. 33.36.1 : 31.43 : 41 : 45.3. LAPEYRONIE, A. Généralités sur les insectes xylophages et la protection des bois. [**Wood-eating insects and the protection of wood.**] *Bois For. Trop.* 7 (3), 1948 (273–91). 80 refs. [F.]

A general survey of types of insect pest (both of living trees and of wood), methods of control, and particularly preservative treatment.

[2081]. 33.36.1 : 33.4 : 33.36.2. BESCHER, R. H. **Treated wood combats mill decay.** *Textile World* 98 (7), 1948 (131). L.S.

Pressure treatment with chromated $ZnCl_2$ has proved satisfactory for flooring and roofing timbers in textile mills; a retention of 1 lb. dry salt per cu. ft. of wood is recommended against decay and termites; and a retention of $2\frac{1}{2}$ lb. will make the wood fire-retardant.

[2082]. 33.36.1 : 33.31 : 31.43 : 13.2. WOLCOTT, G. N. **Termite repellents: a summary of laboratory tests.** *Bulletin, Agricultural Experiment Station, University of Puerto Rico* No. 73, 1947. pp. 18. 11 refs. P.R.

Tabulates the results of tests to show the repellent effect of different organic and inorganic compounds on the West Indian dry-wood termite, *Cryptotermes brevis*. Among organic compounds impermanence in repelling attack is practically universal; only a few of the inorganic compounds show the same characteristic. $CuSO_4$ in solution of 1 oz. per gallon of water (0·15% Cu) has rendered the most susceptible woods (*Bursera simaruba* and *Delonyx regia*) immune to attack for 4 years, as has a solution of $ZnCl_2$ (0·2% Zn). Cr, B, Sb, Pb, and Al show positive values at concentrations of 2% in some compounds. Ferrous compounds are valueless but Fe_2Cl_6 is as repellent as $ZnCl_2$. $CdCl_2$ is the least repellent of the Cd salts; Cd acetate and $CdBr_2$ are more effective than $CuSO_4$. The fluorine compounds of Ba, Li, Na, and K at concentrations of 2% F are repellent, but at less than 1% F they are indecisively toxic. Of the F compounds with the repellent metals, copper fluoride is 10 times as effective as $CuSO_4$; ZnF_2 is 10 times as effective as $ZnCl_2$ and is commercially available at competitive prices. [Cf. *For. Abstr.* 9 (No. 2431).] *From author's summary.*

[2083]. 33.36.1 : 33.31 : 31.43 : 12.29. [**Modified Boucherie for preservative treatment of Bamboo.**] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (102–3).

Further research was continued on the method of using the cavity either at the top or at the bottom of the culm as a reservoir for the treating solution [cf. *For. Abstr.* 7 (No. 1930)]. The reservoir cavity must be given a deep incision at the base, to expose the longitudinal vessels, and the culm should be (*a*) erect during

treatment, (*b*) green, except when using creosote, which penetrates more rapidly through dry culms. The following preservatives were tried by this method:—(*a*) boric acid and borax (1 : 1) in 4% aqueous solution; (*b*) $CuSO_4$ 15% and 30% aqueous solution; (*c*) $ZnCl_2$ 10% and 15% aqueous solution; (*d*) commercial creosote. Culms treated with (*a*) and (*d*) were free of borers after one year's exposure to attack; those treated with (*b*) and (*c*) were appreciably attacked.

[2084]. 33.36.1 : 12.29. NARAYANAMURTI, D., PURUSHOTHAM, A., and PANDE, J. N. **Preservative treatment of Bamboos. Part 1. Treatment of green Bamboos with inorganic preservatives.** *Indian For. Bull.* No. 137, 1947. pp. i + 14 + 2 dgms., 3 gphs.

Experiments on the treatment of green Bamboos with inorganic preservatives are described. While the inner wall of the Bamboo is not very easily permeable to the movement of liquids, it appears to be permeable to $ZnCl_2$ in the molecular or ionic form. Incision of the inner wall aids liquid penetration. Treatment by the original Boucherie process (standing the freshly felled Bamboo in a container of the preservative solution) was found to yield satisfactory results. Good results were also obtained with the cycle-tube method of treating the Bamboos, a period of 5–6 days giving good absorption for Bamboos 15 feet long. With the incised basal internode as reservoir and keeping the Bamboo vertical, satisfactory absorption could be obtained only in the case of *Melocanna bambusoides* and *Bambusa nutans* when the period of treatment was restricted to 24 hrs. For good protection against termites, fungi and borers, treatment by the Boucherie process (cycle tube) extending over 5–6 days is recommended. For outside locations a non-leachable preservative should be used. *Authors' summary.*

[2085]. 33.36.1 : 33.31 : 31.43 : 13.2 : 33.15.1. ***Lyctus* borer investigations.** *Rep. For. Prod. Aust. 1947–8*, 1948 (41–2).

Very promising results have been obtained in protecting green veneer from *Lyctus* attack by immersion in cold H_3BO_3 solution and subsequent block stacking of the treated sheets to permit diffusion. The effects of adding various toxic chemicals to the glues used in bonding plywood are under investigation; good results have been obtained with some chemicals, though proof of their permanence is not yet established.

[2086]. 33.36.1 : 33.31 : 31.43 : 13.2. BAKKEN, H. M. Angrep av pålemark på impregnert trevirke. **[Marine borer attack on impregnated wood.]** *Teknisk Ukeblad* 93 (52), 1946 (722–4). 1 ref. [Nor.] L.S.

Examination of specimens impregnated with creosote, As salts and various commercial preservatives and exposed to marine-borer attack off the coast at Trondhjem for 7 years shows: (1) that As salts are as effective as creosote; (2) that specimens soaked for 7 days in concentrated Cuprinol and in Carbomal 39 (green) showed good resistance to borer attack.

[2087]. 33.36.1 : 33.53 : 31.43 : 13.2 (95). SHILLINGLAW, A. W., and MOORE, D. D. **Report of marine borer survey in New Guinea waters.** *Bull. Coun. sci. industr. Res. Aust.* No. 223, 1947. pp. 40 + 25 photos.

The nature and extent of damage to marine structures is described. Shipworms (*Nausitora*, *Teredo*, *Dicyathifer*, *Bactronophorus*, *Bankia* and *Nototeredo*) were the most destructive agents in New Guinea waters. The zone of first failure of piles in some 90% of cases is within 1 ft. either side of low-tide level. Non-resistant timber in cross and diagonal bracing, placed below mid-tide level, is very susceptible to attack, becoming ineffective in 3–12 months. The following timbers were found resistant (i.e. will have a safe life as piling for not less than 3 years under normal conditions off the north coast of New Guinea) and are recommended for piling in new structures:—*Syncarpia laurifolia*, *Anisoptera polyandra*, *Xanthostemon* sp. (Kasi Kasi), creosote-impregnated Oregon Pine [*Pseudotsuga taxifolia*] and Coconut [*Cocos nucifera*] in short lengths. Some resistant species of *Nauclea*, *Sterculia* and *Urandra* also exist, but are not yet definitely established. The retention of bark on piles will extend their life by 6–18 months, or even longer. *A. polyandra* is recommended for sawn bracing. Non-resistant piles should be protected by one of the following methods:—(1) Sand-filled 'Armco' sheathing. 'Armco' culvert piping is placed around the pile from high-tide level to mudline, and the annular space filled with sand. Protection lasts as long as the piping withstands corrosion (probably not less than 2 years). (2) Tar-plastic sheathing. A galvanized or black iron sheathing is placed around the pile

from mid-tide level to mudline, and the annular space filled with a mixture of tar, sand and cement, which will set hard and outlast the metal sheath. (3) Metal sheathing. Flat galvanized-iron sheathing, fastened closely around the pile from mudline to high-tide level, will give protection until the metal corrodes (at least a year).

Preservative treatment (heavy brush-application of creosote, and spraying with creosote at 6-monthly intervals) is essential to prevent fungus decay of many resistant species (including *A. polyandra* and *S. laurifolia*) above high-water level. Soft and non-durable timbers in decking, headstocks, girders, etc. are also susceptible to serious fungus attack. [Cf. *For. Abstr.* 9 (Nos. 2289–90).]

[2088]. 33.36.1 : 12.25. **[Preservative treatment of *Pinus radiata*.]** *Rep. N.Z. For. Serv. 1947–8*, 1948 (49–50).

Further investigations were made of the dipping of kiln-dried *Pinus radiata* timber in an oil-solvent preservative immediately after withdrawal from the kiln and before appreciable cooling of the timber had occurred. Eight-foot lengths of 4 × 2-in. timber were immersed while hot for periods of 10–30 minutes, good absorption and penetration being obtained. This method of preservation appears to have a practical application where it can be arranged for timber to be dipped immediately after withdrawal from the kiln.

[2089]. 33.36.1 : 12.26–8. **The preservative treatment of Eucalypt truewood.** *Rep. For. Prod. Aust. 1947–8*, 1948 (40–1).

Satisfactory penetration of creosote was obtained in specimens of *Eucalyptus globulus*, *E. capitellata*, *E. calophylla*, *E. diversicolor*, *E. eugenioides*, *E. marginata*, *E. obliqua*, *E. sieberiana*, and *E. viminalis*, using pressures of 100 lb./sq. in. Average absorptions of over 6 lb. per cu. ft. were obtained. *E. consideniana* gave unsatisfactory results. Experimental treatment of sleepers is now being undertaken. [Cf. *For. Abstr.* 9 (No. 2422).]

[2090]. 33.36.1 : 33.15. **[Pressure treatment of plywood.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (53, 55).

Mango plywood (3-ply, $\frac{3}{16}$ in. thick and measuring 13 × 13 in.) was pressure-treated with creosote/fuel oil (50 : 50) and Ascu (8%), using the Lowry process. Both casein-bonded and protein-bonded plywood were used. With creosote, the average absorptions were 24·9 and 26·8 lb./cu. ft., and with Ascu 30·5 and 31·2 lb./cu. ft. respectively. The plywood did not delaminate during the process, and glue-adhesion tests showed that the treatments had no adverse effects. Creosote treatment appears to give a slight increase in wet strength.

[2091]. 33.36.1 : 33.51 : 33.36.2. WATKINS, S. S. **Wood preservation for mines.** *Mining Congress Journal* 34 (4), 1948 (75–7). L.S.

Preservative treatment for mining timber increases its service life, decreases risk of fire and allows the use of a greater variety of species. Figures given show that treated timber need last only 11 years to be more economical in use than untreated timber with an estimated service life of 6 years.

[2092]. 33.36.1 : 33.52 : 12.26–8 (921). HEIDEMA, E. J. Het proefbedrijf van het Boschwezen voor aanmaken en verkoop van geimpregneerde kempasliggers te Bengkalis. **[The Bengkalis experimental plant of the Netherlands East Indies Forest Service for the manufacture and sale of impregnated *Koompassia malaccensis* sleepers.]** *Tectona* 35 (1/2), 1942 (36–54 + 2 plates). [Du.]

Discusses this enterprise, established in 1939 for treating Kempas sleepers with Ascu preservative, under the headings: timber supplies; timber purchase; financial basis; sawing and storage; defects of the timber; the timber-yard and impregnation; financial results, profitability and future prospects.

[2093]. 33.36.1 : 33.52 : 12.26–8 : 33.31. **Result of railway sleeper service tests.** *Malay. Forester* 11 (4), 1948 (169–72).

Sleepers of various grades of Keruing (*Dipterocarpus* spp.) and Kempas (*Koompassia malaccensis*) were given various forms of pressure treatment with creosote, Diesel oil, and Tanalith. After 13½ years' service, about 70% of Kempas and 82% of Keruing sleepers treated with creosote were still sound. It appears that, to attain the same life, Kempas needs a heavier impregnation with preservatives than Keruing (about 6 lb./cu. ft. compared with about 4 lb.). Sleepers without sole plates gave better results (89% still in service after 20 years) than those with them. Tanalith gave less satisfactory results. A test was made with 15 untreated Betis [*Payena utilis*] sleepers, of which 9

were still in service after 15 years. The main causes of failure seemed to be spike killing or termite attack at the ends.

33.36.2. *Fireproofing*

See also *For. Abstr.* 10 (Nos. 2081, 2091).

[2094]. 33.36.2 : 33.31. ILLE, R., and CHYTRY, J. Pokusy se snížením hořlavosti dřeva chemickými prostředky. **[Experiments on reducing the combustibility of wood by chemical means.]** *Zpr. vyzkum. Úst. lesn. ČSR* No. 1, 1947 (216–39). [Cz.e.russ.] [Ustav lesní těžby a technologie dřeva, Prague.]

Tabulates and discusses results of tests, by Truax & Harrison's method, on numerous salts and mixtures tried as fireproofing agents, together with some data from small-scale outdoor combustion tests on treated wooden sheds.

In tests of Beech and Silver Fir treated by dipping: (1) salts of Sn, Sb, Mo and W were the most effective (though far too expensive for practical use); (2) those of Zn, NH_4 and Mn gave good, and those of Mg, Cu and Fe poor protection; while (3) those of K, Na and Al were ineffective. Iodides, bromides, sulphites, phosphates and borates were more effective than other salts, but are expensive.

Coatings of silicates of Na or K were effective, especially if a little ammonium phosphate (which also reduces leaching) was added. Waterglass coatings incorporating non-inflammable powders, e.g. glass, infusorial earth, were also effective. The last-named combination proved very resistant to leaching and would be suitable for exterior work. The desirability is urged of resuming studies, interrupted by the war, on synthetic-resin coatings for fireproofing wood.

[2095]. 33.36.2 : 33.8. **Reducing fire risk in ships. II. Work on naval fabric and timber.** *Fire Prot., Lond.* 11 (96), 1948 (388–90). P.R.

The section on fireproofing ships' timber recommends 2 methods: (1) (for treating timber in bulk) vacuum impregnation with mono-ammonium phosphate; (2) (a simple process for small made-up articles) immersion for about one hour in a hot solution (20–30% strength by weight) of urea phosphate in industrial methylated spirit. Where immersion is impracticable, brush application can be substituted but is less satisfactory. Both these methods are approved by the Admiralty.

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 10 (Nos. 1935, 1992, 2119, 2132, 2143).

[2096]. 33.36.3 : 12.26–8 : 32.25 : 32.24. CALLIN, G. Syrfällning och randbarkning av björkkolved. **['Sour felling' [felling in the growing season and leaving crowns intact for a while to effect seasoning by transpiration] and strip-barking of Birch charcoal wood.]** *Norrlands SkogsvFörb. Tidskr.* 1945 (2), (135–52). [Sw.sw.]

Air-seasoning trials of 1 year's duration were made in the Elgåland Crown Park, Lycksele, to determine the best time for 'sour felling' and to compare the drying of 'sour-felled' wood with that of strip-barked (1–4 longitudinal strips removed, according to diameter). From the results (shown in tables and graphs) it is concluded that: (1) Any time from early March to mid-August is equally effective, so far as drying is concerned, for 'sour felling' Birch. (2) On reasonably favourable aspects, any time up to mid-July (the start of the rot season) is almost equally good for strip-barking. (3) After a single drying season 'sour-felled' and strip-barked wood have about the same moisture content. Storage for a further year has no effect on the moisture content of 'sour-felled' wood, but gives considerable further drying in strip-barked wood. If it is possible to give the wood 2 seasons' drying, strip-barking will be the superior method.

[2097]. 33.36.3 : 12.26–8 (54). **[Air seasoning of some Indian timbers.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (43–4).

Tests on *Heritiera minor*, *Parrotia jacquemontiana*, *Gmelina arborea*, *Pterocarpus marsupium*, *Sterculia villosa* and *Hymenodictyon excelsum*.

[2098]. 33.36.3 : 33.53 : 12.26–8. **[Seasoning Eucalypt poles.]** *Rep. For. Dep. Uganda 1947*, 1948 (18–9).

A small experiment was made to determine the approximate rate of drying of *Eucalyptus saligna* and *E. robusta* poles stacked in the open. Poles of 3, 4, 5, and 6 in. diam. at the butt were used, one 20-ft. pole for each diameter class. A rapid initial loss of weight was followed by a

gradual loss which fluctuated with the weather. *E. robusta* dried out more gradually than *E. saligna* and, having a higher initial moisture content, lost a greater percentage weight. Very roughly, the average loss in weight for *E. saligna* was 24% in 1 month, 36% in 2 months, 39% in 3 months and 47% in 9 months. For *E. robusta* the corresponding figures were 17, 26, 39 and 54%.

[2099]. 33.36.3 : 12.26–8 (54). [**Kiln drying of Indian hardwoods.**] *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (42–3).

Notes on tests of *Grewia tiliaefolia, Heritiera minor, Gyrocarpus jacquinii, Anthocephalus cadamba, Canarium* sp., *Sterculia villosa, Populus ciliata, Manglietia insignis* and *Vitex altissima.*

[2100]. 33.36.3 : 01.4 : 33.8. THIRY. Une intéressante réalisation dans le domaine du séchage artificiel de bois de forte épaisseur. [**An interesting development in the artificial seasoning of very thick wood.**] *Rev. Bois Appl.* 3 (6), 1948 (23–4). [F.]

A new method has been developed for seasoning blanks (of Beech, Hornbeam and Plane) for shoe lasts, where stability of the manufactured article is essential. The blanks are first soaked in a chemical bath to impregnate them to a depth of 1·5–2 mm. They are then stacked on trucks and dried in an air tunnel in which the temperature is controlled to 30–35° C. at the entrance, increasing to 45–55° at the exit (a cycle of 16 days) and the moisture content of the air to 65–70% decreasing to 38–40%. The heating and ventilating apparatus of the kiln are in use for 11 hours each day. The effect of the strong current of hot air on the chemical with which the blanks have been impregnated is to draw the moisture gradually from the centre to the surface. The treatment has no effect on strength properties or colour of the wood, which is ready for immediate use.

[2101]. 33.36.3 (711) : 09.4. GUERNSEY, F. W., and ARCHER, C. F. **Survey of dry kiln situation in the southern coast region of British Columbia.** *W. Cst. Lumberm.* 75 (8), 1948 (89).

In 1947 only 26 of the 400 important producing sawmills in the Vancouver Forest district had drying kilns. Production of these 26 mills averaged about 65% of the total cut for the region. Cross-circulation-type kilns were most common. Many of the mills with no seasoning facilities produced items which are not usually seasoned, such as sleepers, dimension stock, etc., but if a need for more seasoned timber should arise, it could be met by:—(1) air seasoning, (2) drying sheds heated with hot air, or (3) pooling of resources of several small mills to build and share a conventional kiln.

[2102]. 33.36.3 : 07.7 : 12.26–8. **Kiln design and plant layout.** *Rep. For. Prod. Aust. 1947–8*, 1948 (36–7).

Performance tests have been made with a timber pre-drier, designed by the Australian Division of Forest Products, and intended for use in areas with poor drying conditions. The timber is air-dried on a progressive principle, but no periodic movements of timber within the drier are necessary, since points of entry and discharge of the circulating air can be changed at will by means of a damper system. In tests with 1-in.-thick Tasmanian *Eucalyptus obliqua*, drying from the green state to about 25% mean moisture content required approximately 3 weeks. [Cf. *For. Abstr.* 9 (No. 2440).]

[2103]. 33.36.3 : 01.4. **Use of kiln samples in operating a lumber dry kiln.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1607 (rev.), 1948. pp. 9 + 2 photos, 4 dgms. 4 refs. P.R.

[2104]. 33.36.3 : 31.27 : 12.25. ALEXANDER, J. B., and ARCHER, C. F. **The effect of kiln-drying upon the strength of Western Hemlock [*Tsuga heterophylla*].** *Circ. For. Prod. Lab., Can.* No. 64, 1947. pp. 11.

Material was kiln dried according to 5 different schedules and then tested for static and impact bending strengths, crushing strength and Izod value. The results are tabulated. It is concluded that for Western Hemlock destined for aircraft construction or repair, the limiting temperature for kiln drying without strength impairment is in the neighbourhood of 150° F., case-hardening and loss of impact bending strength occurring in timber seasoned at 160°. Two of the schedules tested were found satisfactory for aircraft timber; for other uses of the wood, higher temperatures and lower relative humidities may be used.

[2105]. 33.36.3 : 33.4. STEVENS, W. C. **Seasoning timber for high class joinery in buildings.** *Timber News* 56 (2113), 1948 (413,

416). [Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks.]

33.37–8. Destructive Distillation. Charcoal and By-Products. Use of Wood and Charcoal for Gas Manufacture

See also *For. Abstr.* 10 (Nos. 2115, 2132).

[2106]. 33.37–8 : 02.1 : 07.7. BERGSTRÖM, H. Handbok för kolare. Del 1. Kolning i mila—skorstensmilor. Del. 2. Kolning i ugn. **[Handbook for charcoal burners. Part 1. Burning in beehive and pit-kilns. Part 2. Burning in retorts.]** Jernkontoret, Kungsträdgårdsgatan 6, Stockholm. 4th ed., 1947. pp. 169 + 138. 114 refs. [Sw.] Price: 8.50 kr. (14*s.* 6*d.*).

A detailed study of methods. Part 1 includes: the preparation of the wood, the construction of beehive and old-style pit kilns, treatment of the charcoal after burning; transport, costs and marketing. Part 2 includes: types of retort, by-products, effect on yield of different species, the part of the tree, and different treatments (distillation under pressure, hydrogenation, etc.), properties and structure of charcoal, and the use of gas by-products.

[2107]. 33.37 : 07.7. VILA, A. Recherches sur la distillation du bois. **[Research on wood distillation.]** *Rev. Bois Appl.* 3 (9/10), 1948 (20–1). [F.]

Experiments with an apparatus suitable for use in small forest units and capable of carbonizing 2–3 tons of wood in 24 hr., produced on an average from mixed woods (Hornbeam, Birch and Beech) 24 kg. charcoal, 0·85 kg. raw methyl alcohol and 16·7 kg. tar, from 100 kg. wood. The author concludes that the establishment of small forest units, with central distilleries for the purification of the tars and raw methyl alcohol would be an economic proposition.

[2108]. 33.38.1 (94). **Charcoal burning for the man on the land.** *Leafl. For. Comm. Vict.* No. 2, 1942. pp. 15.

[2109]. 33.38.2 (494). HOFMANN, E. Von der Holzentgasung. Ein Rückblick. **[Gas manufacture from wood: a retrospect.]** *Schweiz. Z. Forstw.* 99 (7), 1948 (338–62). [G.f.]

Compares various solid fuels from the point of view of town-gas manufacture, with special reference to coal and wood. Reviews the 3 processes (viz. ordinary distillation, complete gasification, and distillation over incandescent charcoal) tried for wood-gas manufacture, and examines the questions of thermal efficiency and costs. Concludes that manufacture of town gas from wood is costly and thermally inefficient, but commends Swiss gasworks for their successful use of wood during the wartime shortage of coal. [Cf. *For. Abstr.* 8 (No. 1273).]

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

See also *For. Abstr.* 10 (No. 1896).

[2110]. 33.39 (471) : 12.25. ANT-WUORINEN, O. V. A. **Wood saccharification activity in Finland.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O.*] *Sub-committee on Wood Chemistry, Geneva* 1948 (30). [E.] [State Institute of Technical Research, Helsinki.] P.R.

Describes the wood-saccharification method used on a pilot-plant scale in Finland since 1940 and advances made in the production of pure crystalline grape sugar from Pine chips.

[2111]. 33.39 : 33.1 : 34.6 (44). FAUCOUNAU, E. L. **Utilization of woodwaste.** [*Proceedings of the*] *Second Meeting of the* [*F.A.O*] *Sub-committee on Wood Chemistry, Geneva* 1948 (27–9). [E.] [Institut du Pin, Bordeaux.] P.R.

Describes briefly the usual methods of hydrolysis and, in detail, (1) the Giordani Leone process, using concentrated H_2SO_4, in which the cellulosic materials are converted into sugars in 2 stages; the yield, using Pine, is about 30 litres of alcohol per 100 kg. dry wood. The acid can be recovered but the operation requires a plant larger than that used for the hydrolysis and uses a large amount of fuel; (2) the Brus-Faucounau process, in which the cellulosic substances are hydrolysed with concentrated acids, which by treatment with NH_3 can be converted to useful commercial products—when H_2SO_4 is the acid used, to $(NH_4)_2SO_4$. It is claimed that as this process requires no special equipment, and as all the acid used is recovered, it is economically

attractive. In addition, both the $(NH_4)_2SO_4$ and the lignin can be used as fertilizer, and it is suggested that they should be used, in particular, to enable artichokes and similar crops to be grown in the fire lanes of the Landes forests. [Cf. *For. Abstr.* 9 (No. 1154).]

[2112]. 33.39 : 31.3. HAJNY, G. J., GARDNER, C. H., RITTER, G. J., and MCCOY, E. **Thermophilic fermentation of cellulose in wood.** *Journal of Bacteriology* 56 (2), 1948 (151). O.R.S.

A new culture obtained from Dr. Virtanen, Helsinki, produced a mixture of acetic, butyric and lactic acids in yields of 14·6% of the fermented wood of raw Sweet-gum, and 27·0% of the wood when previously treated with mild acid sufficiently to loosen the association between the lignin and the cellulosic materials. The yield of the conversion products from raw Sweet-gum is lower than from raw Birch (21·2%) and raw Aspen (27·1%). The yield from the mildly hydrolysed Sweet-gum, however, exceeds that from raw Birch and approximates to that from raw Aspen.

[2113]. 33.39. HARRIS, E. E., HANNAN, M. L., and MARQUARDT, R. R. **Production of food yeast from wood hydrolyzates.** *Industr. Engng. Chem.* 40 (11), 1948 (2068–72). 22 refs. [Forest Products Laboratory, Madison.] P.R.

Wood-sugar solutions to which had been added 3·4 lb. of N in the form of urea, 1·6 lb. P_2O_5 as phosphate salts, and 1·1 lb. KCl, gave for each 100 lb. sugar, yeast yields of 40–50% of the fermentable sugar. Requirements for maximum yields were 3·2 lb. N, 1·5 lb. P_2O_5 and 1 lb. KCl. The addition of $MgSO_4$ did not change yield or rate of growth of the yeast. The presence of sulphite during the neutralization of the sugar prior to yeast production increased the yield; so did the addition of O_2 to the air supply. Of the species of wood used (Larch, Douglas Fir, Lodgepole Pine and Southern Red Oak) the yield of yeast was highest from Oak and Lodgepole Pine, but the highest utilization of reducing substances was made in the case of Douglas Fir and Lodgepole Pine. Results are tabulated. *From authors' summary.*

[2114]. 33.39 : 33.32.1 : 34.6. ENEBO, L., JOHNSSON, E., and LUNDIN, H. Jäsningsförsök med indunstad sulfitlut. **[Experiments on the fermentation of evaporated sulphite waste liquor.]** *Svensk PappTidn.* 50 (11*b*), 1947 (72–5). 1 ref. [Sw.sw.] [Kungl. Tekniska Högskolan, Stockholm.] D.S.I.R.

Describes the results of experiments to ascertain the effect of preliminary evaporation of sulphite waste liquor on the degree of fermentation and on the yield of alcohol. Concludes from the results, which are tabulated, that, for a concentration of the reducing substances up to 75 g./l., preliminary evaporation has no harmful effect.

[2115]. 33.39 : 34.26 : 12.26–8 : 33.37–8. FARMER, R. H., and CAMPBELL, W. G. **Production of a metallurgical coke from the resin of Wallaba wood (*Eperua* sp.).** *J. Soc. chem. Ind., Lond.* 67 (6), 1948 (233–4). 4 refs. [Forest Products Research Laboratory, Princes Risborough.] P.R.

The wood of the Wallaba tree [*Eperua* sp.] of British Guiana contains a high proportion of an alcohol-soluble resin of a phenolic type. It is shown that this resin can be converted by controlled destructive distillation into a metallurgical coke of high purity and good physical properties; this coke has been submitted to small-scale industrial trials in metallurgical processes and has proved satisfactory. The volatile products of the distillation include a complex mixture of phenols with useful fungicidal properties, and a combustible gas. *From authors' summary.*

33.4. *Converted Structural Timber*

See also *For. Abstr.* 10
(Nos. 2141, 2199, 2202–4).

[2116]. 33.4 : 31.0 (943). WATSON, C. J. J. **South Queensland building timbers and specifications for their use.** *Pamphl. Qd. For. Serv.* No. 2, 1947. pp. 28.

Over 100 South Queensland timbers are listed in a table, showing their suitability for various constructional purposes, their durability, strength, colour, hardness and weight. The pamphlet also includes extracts from Australian standard grading rules for flooring and for sawn and hewn structural timbers. [Cf. *For. Abstr.* 2 (p. 44).]

[2117]. 33.4 : 31.0 : 12.26–8. WRIGHT, G. W. **Red Gum as a flooring timber.** *For. Prod. News-Lett. C.S.I.R. Aust.* No. 166, 1948 (1–2).

Information on the seasoning, machining, grading and general serviceability of Red Gum (*Eucalyptus rostrata*) flooring.

[2118]. 33.4. **Oak floor sections have rubber lining.** *Science Illustrated* 3 (10), 1948 (71). D.S.I.R.

The flooring is in the form of squares made up of kiln-dried hardwood boards 1 in. wide and ¼-in. thick, insulated on all 4 edges by a latex-filled strip of non-skid fibrous material. The same material forms a base for the square and prevents dirt from coming up between the boards. The squares are fastened in position by a mastic glue applied to the base. It is claimed that the flooring costs no more than conventional Oak boards and that speed of installation (1 sq. ft. can be laid per min.) brings down the ultimate cost. The flooring is now available in Tennessee Oak and will be made in Birch, Beech, Maple and Walnut.

[2119]. 33.4 : 31.22. LHOTA, O. Hygroskopicita dřeva a její vyznam pro použiti vlysů a parket v pozemním stavitelství. [**The hygroscopicity of wood and its significance for parquet flooring.**] *Lesn. Práce* 27 (3), 1948 (65–79). 10 refs. [Cz.russ.]

A review, stressing the need for humidity control (the moisture content of the blocks should not exceed 10%) during storage at the factory and in the building where the floor is being laid.

[2120]. 33.4 : 33.15.2 : 31.27. MACK, J. J. **Project T.M. 23–2. Tests on plywood flooring. Progress report No. 1.** *Div. For. Prod., Coun. sci. indust. Res., Aust.* 1947. pp. 5 + 1 dgm., 33 gphs., 1 tbl. 2 refs. P.R.

[2121]. 33.4 : 33.15.2. **The manufacture of laminated flooring by a continuous process.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 22, 1948 (61–72). T.D.A.

Describes a manufacturing process developed experimentally by Madison and used at a Tennessee Valley Authority pilot plant, with data on manufacturing costs.

[2122]. 33.4 : 33.15.2. Poutres composées en bois. [**Compound wooden beams.**] *Rev. Bois Appl.* 3 (11), 1948 (29–30). [F.]

[2123]. 33.4 : 33.15.2 : 38.2. WILSON, T. R. C., and COTTINGHAM, W. S. **Tests of glued laminated wood beams and columns, and development of principles of design.** *Rep. U.S. For. Prod. Lab., Madison* No. R1687, 1947. pp. 36 + 7 photos, 4 dgms., 30 gphs., 23 tbls. 14 refs. P.R.

[2124]. 33.4 : 33.15.4 : 33.32.3. **Laminated partitions.** *Timb. & Plyw.* 95 (2457), 1948 (259–60). P.R.

Describes the 'Kähr' laminated-board construction developed in Sweden. These partitions have so far been used mainly in boats, but are also suitable for use in prefabricated and permanent houses. The boards are of 3 types, consisting of a laminated timber core with (1) ⅛-in. hardboard on each side; (2) ⅛-in. hardboard on one side and ½-in. insulation board and ⅛-in. hardboard on the other; and (3) ½-in. insulation board and ⅛-in. hardboard on each side. The blockboard core incorporates incisions to a depth of ⅞ of its thickness, made alternately and at regular intervals in all 4 sides of each core element; these increase stability in the timber.

[2125]. 33.4 : 33.15.2 : 38.2. NICHOLLS, W. **Plywood panelling. I. New techniques utilizing plywood for building interiors. II. Corner and ceiling treatments for modern architectural effects. III. Adaptation to door and window frames; erection methods; built-in units; finishing.** *Timb. & Plyw.* 94 (2449; 2450), 1948 (937–8; 977–9); 95 (2451), 1948 (21, 24). P.R.

[2126]. 33.4 : 33.15.4 : 33.32.3. **Properties of four experimental flush-type doors, including a tentative test procedure.** *Technical Paper, Housing and Home Finance Agency, U.S.A.* No. 10, 1948. pp. 8 + 3 photos, 1 gph. P.R.

Experimental doors tested (at Madison) consisted of: (1) Balsa core and plywood facings; (2) fibreboard core of grid construction and hardboard facings; (3) corrugated fibreboard core of honeycomb construction and hardboard facings; and (4) core of sections of fibreboard tubing and plywood facings. All had solid-wood edge frames. They were compared with a conventional door having 5 cross panels. The experimental doors were superior to the conventional one in stiffness. The doors with Balsa and corrugated fibreboard cores were slightly superior to the conventional door in impact strength, but the other 2 experimental doors compared less favourably. The

experimental doors were in general equal to the conventional door in resistance to exposure to cycles of high and low relative humidity, warping and immersion.

[2127]. 33.4 : 33.15.2. **Plywood tubes for door cores.** *Resin. Reptr.* 9 (5), 1948 (10–1). P.R.

Plywood tubes are band-sawn into sections, and the latter, arranged in rows, are used to form the cores of hollow doors with plywood faces. [cf. previous abstract.]

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

See also *For. Abstr.* 10 (Nos. 1913, 2091–3, 2098, 2199, 2321).

[2128]. 33.52 : 33.91. **Storage of coniferous sleepers.** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (45).

Sleepers of *Cedrus deodara*, *Abies pindrow*, and *Picea smithiana* (*morinda*) cut at 10,000 ft. elevation are liable to an appreciable amount of cracking at foot-hill launching depots in the hot season, unless stacked under heavy forest shade.

[2129]. 33.53 (410) : 33.36. BUTLER, S. C. **Softwood transmission poles in Britain.** *Aust. For.* 12 (1), 1948 (43–6).

33.6. *Packing Boxes, Crates, etc.*

See also *For. Abstr.* 10 (Nos. 2140–1).

[2130]. 33.6. CARLSON, T. E., and KUELLING, H. J. **Forest Products Laboratory proposes new designs for unsheathed crates.** *Repr.* from *Traffic World* June 12, 1948. pp. 3. [Forest Products Laboratory, Madison.] P.R.

Describes collapsible crates designed and tested at Madison. The base and top are of a conventional design, but the side and end pieces are new, and consist of 2 series of diagonal members, placed one inside and one outside the horizontal members, the 2 series sloping in opposite directions. This arrangement (the vertical cross-section of each panel being symmetrical) increases stability, resistance to super-imposed loads, and stiffness. The crates use 30–40% less wood than fully-sheathed ones, and laboratory tests show them to be comparable in performance. Proposed design data have been developed and are given in tables.

[2131]. 33.6 : 34.28 : 12.29. **Testing of packing cases.** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (36–7).

Tests showed that baskets made from mature culms of Bamboo are very much stronger than those made from young culms, and also retain their shape better, as they shrink and swell much less than immature ones. They can easily be stripped after soaking in water.

33.7. *Firewood*

[2132]. 33.7 : 33.38.2 : 33.36.3. LHOTA, O. Nový způsob sušení generátorovych špalíčků. **[A new method of drying small wood blocks for producer-gas generators.]** *Zpr. vyzkum. Úst. lesn. ČSR* No. 1, 1947 (240–52). 5 refs. [Cz.e.russ.] [Ústav pro lesní stavebnictví, dopravnictví, meliorace a hrazení bystřin, Prague.]

Describes preliminary work on a method of drying small wood blocks by first steaming under pressure, then exhausting the steam and drying under reduced pressure. Further work is to be done, particularly on economic aspects of the method.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 10 (Nos. 1980–1, 1984, 1990, 2006, 2100, 2139).

[2133]. 33.8 : 33.15.2 : 33.15.1. TOWERS, W. K. **Propeller manufacturing process.** *Veneers & Plyw.* 42 (6), 1948 (40, 42). P.R.

[2134]. 33.8 : 33.15.2. **Laminated wood rolls [for printing wall-paper and linen materials].** *Bull. Ntheast. Wood Utiliz. Coun.* No. 22, 1948 (55–8). [Timber Engineering Co., Washington, D.C.] T.D.A.

[2135]. 33.8 : 33.15.2. **[The manufacture of] laminated golf-club heads.** *Wood* 13 (10), 1948 (276–8).

[2136]. 33.8 : 31.0 (94). HEBBLETHWAITE, C. H. **The selection of timbers for handles.** *For. Prod. News-Lett. C.S.I.R. Aust.* No. 164, 1948 (1–2).

The timbers best suited for handles are those with high toughness and a list is given showing the toughness value of Australian timbers compared with American Hickory, American Ash and European Ash, with a high, medium and

low toughness value respectively. The necessity of grading handle stock is emphasized and certain impermissible defects are mentioned.

[2137]. 33.8 : 31.0 (94). **Battery separators.** *Rep. For. Prod. Aust. 1947–8*, 1948 (23–5).

Tests were made on a number of species to find suitable substitute woods for battery separators. Only Klinki Pine [*Araucaria klinkii*] and Yellow Sassafras [*Doryphora sassafras*] were satisfactory in all properties. Klinki Pine compared favourably with Port Orford Cedar [*Chamaecyparis lawsoniana*], Kauri [*Agathis* sp.] and Douglas Fir, and may have a longer life than Douglas Fir.

33.9. *Grading [including Standard Specifications] and Storage of Converted Timber*

See also *For. Abstr.* 10 (Nos. 2128, 2199).

[2138]. 33.91 : 31.27. **Stress grading of timber.** *Times Rev. Industr.* 2 (18), 1948 (25). D.S.I.R.

Discusses the value of stress grading in increasing efficiency and economy, and gives the basis of grading rules.

[2139]. 33.91 (410) : 33.8. **Kitchen fitments and equipment.** *Brit. Stand.* No. 1195, 1948. pp. 38. P.R.

Materials considered include solid timber, plywood and various sorts of fibreboard. Appendixes list species of timber suitable for carcasses and for plywood.

[2140]. 33.91 (82) : 33.6. Dictáronse normas para la fabricación de envases de maderas de productos de exportación. **[Standards have been established for the manufacture of wooden containers for export products.]** *Maderil, B. Aires* 20 (240), 1948 (23–4). [Span.]

A copy of regulations formulated by the Argentine Secretariat of Industry and Commerce.

[2141]. 33.91 (68) : 12.25. **Specifications for graded South African softwood timber.** *S. Afr. Bur. Stand. Specif.* No. 5, 1948. pp. 31 + 31. [E.Afrik.] P.R.

Gives specifications, with tables showing grading according to defects, for structural timber, factory timber, box timber, floor boards, floor blocks, ceiling, lining and weather boards, mouldings, box shooks, and shingles, and lays down methods of testing and of measuring defects.

[2142]. 33.91 : 12.26–8. ZASADA, Z. A. **Aspen [*Populus tremuloides*] lumber grades and characteristics.** *Lake St. Aspen Rep.* No. 6, 1948. pp. 9. 9 refs.

[2143]. 33.92 : 07.7 : 31.43 : 12.29 : 12.26–8 : 33.15.1 : 32.82. **[Use of Bamboo stickers in storing plywood.]** *Rep. For. Dep. Uganda 1947*, 1948 (21–2).

A report on a commercial test of various Uganda species for the manufacture of plywood states that *Canarium schweinfurthii* proved totally unsuitable, being too soft, too open in texture, and having too heavy a starch content, with the result that it is liable to borer attack. In view of the fact that *Canarium* has proved suitable for veneers in other countries, it is suggested that the logs may have been stored too long before conversion. Moreover, the use of untreated Bamboo (*Arundinaria alpina*) stickers in the factory did not help, for it has been discovered at Nairobi that the Bamboo borer (*Dinoderus* sp.) is taking to eating plywood when brought into contact with it in this manner. The advisability of treating split Bamboo, whether used for stickers or for roofing (a new development) is apparent. It is probable that Bamboo can be rendered beetle-proof by soaking in water for 6–8 weeks. [Cf. *For. Abstr.* 10 (Nos. 1953–4).]

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

See also *For. Abstr.* 10 (Nos. 1664, 1761).

34.21. Fodder Grass and Grazing. Forest Litter

See also *For. Abstr.* 10 (No. 1805).

[2144]. 34.21 (436) : 97.3 : 07.2. DOMES, N. Untersuchungen über Waldweide: I. Die Waldweide und die Ermittlung des Waldweideertrages. **[Investigations on forest pasturage: I. Forest pasturage [in Austria] and the determination of forest pasture**

yields.] *Cbl. ges. Forstw.* 70 (1), 1947 (39–51). 24 refs. [G.]

Making no attempt to examine the question of forest grazing as a matter of land-use policy, the author urges the importance of finding a basis for reliable assessments of forage yields in Austrian mountain-forest pastures, and considers in detail the factors to be investigated and the experimental set-up necessary to gain data for the compilation of forage yield tables for forest pastures.

[2145]. 34.21 (436). ECKMÜLLER, O. Die Formen der Waldweide im steirischen Bauernwald. **[Forms of forest grazing in Styrian farm forests.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (15/16), 1948 (121–3). [G.]

[2146]. 34.21 (471) : 60.1 : 09.4. JÄNTTI, A. Suomen laidunolot. **[Pasturage conditions in Finland.]** *Acta for. fenn.* 53 (2), (1945) 1947 (1–255). 135 refs. [Fi.g.]

The report on a survey of 1938.

[2147]. 34.21 (485) : 60.1. TIRÉN, O. Skogsbete—kulturbete: några vunna erfarenheter från Västerbottens län. **[Forest versus cultivated pasture: some experiences in Västerbotten.]** *Från Skogsvårdsstyrelsernas Arbetsfält*, 1948 (57–75). [Sw.] *Suppl.* to *Svenska SkogsvFören. Tidskr.* 46 (4), 1948.

Emphasizes that forest grazing is injurious to the forest, to the beasts, and to their owner's finances, and estimates the cost of disease, poor milk yield, accidents and wasted time, at about Kr. 1 million per annum in Västerbotten. Discusses artificial pastures with reference to choice of land, establishment costs, fertilizing, seed mixtures and subsidies, with supplementary notes on sheep pasturage and the clearance of stumps.

34.23. Wood Ash. Potash

[2148]. 34.23 (54) : 34.21. PRASAD, M., and DANGE, G. V. **Plant and wood ashes. A potential source of commercial potash.** *Indian For. Leafl.* No. 95, 1947. pp. 27. 4 refs.

Ashes obtained from various plant sources (weeds, shrubs, hedge clippings, forest litter and twigs of large trees) were analysed and the results tabulated. A scheme is suggested for the manufacture of K salts from these ashes on a cottage-industry scale.

34.24. Tanning Materials. Cork. Bark Products

See also *For. Abstr.* 10 (Nos. 1704, 2033, 2038).

[2149]. 34.24 : 12.26–8 (140). SNOW, C. F. F. **Sussex bark-strippers.** *Ctry. Life, Lond.* 102 (2651), 1947 (924–5). O.B.

Stripping Oak bark for tannin, though now somewhat rare, is still carried out in remote parts of England. It is done mostly in April or May, when the sap is rising. Workmen observed in Sussex first marked out the felled trees with small, sharp axes, a straight line being cut along the trunk and other ring cuts being made at intervals of about 3 ft. The bark was then stripped with a hand tool resembling a small round-ended spade, and called a spud. The bark is put to dry in the woods on a rough framework, and in good weather is ready for the tanyards within a week.

[2150]. 34.24 : 12.26–8 : 12.11.11. CATRAVAS, G. N., and KIRBY, K. S. **Recent investigations on the [chemistry of] tannins of Sumach and Mimosa extract.** *Journal, Society of Leather Trades' Chemists* 32 (5), 1948 (155–65). 11 refs. L.S.

[2151]. 34.24 : 12.25 : 12.26–8. FRITZ, E. **Bear Clover and Redwood as tannin possibilities.** *J. For.* 46 (9), 1948 (688–9).

Two possible sources of tannin are:—(1) *Chamaebatia foliolosa*, a shrub which forms solid masses under the Pine forests of the Sierra Nevada and is regarded as a nuisance because it prevents natural regeneration and constitutes a serious fire hazard. Analysis shows it to contain 11·9–13·2% of tannin. (2) *Sequoia sempervirens* heartwood. This contains 5–12% of tannin, and it is suggested that the large quantities of logging and mill waste could be utilized for its extraction. The tanning value of these materials should be tested.

[2152]. 34.24 : 12.26–8 (46). MEDIR JOFRA, R. La industria corchera. (Descripción general). **[The [Spanish] cork industry. (General description).]** *Montes, Madrid* 4 (23), 1948 (449–55).

[2153]. 34.24 (61) : 12.26–8 : 98.3. PÉRIALE, M. O sobreiro na África do Norte. **[Cork Oak in North Africa.]** *Bol. Junta nac. Cortiça, Lisboa* 8 (91), 1946 (300–3). [Port.]

A short account of the Cork Oak trade in Algeria and Morocco, with a brief description of methods of exploitation, cultivation and production. In Algeria, which produces $\frac{1}{6}$ of the total world supply of cork, trees are stripped from the age of about 9 to 150 years. The Lamey method is generally followed. In Morocco it has been the task of the Forest Service since 1912 to protect and re-stock the over-exploited and decadent forests, among which are 425,000 ha. of Cork Oak, 300,000 of them pure stands. Morocco cork is usually of inferior quality to that of Algeria. Trees are generally stripped in a cycle of 9–12 years, according to their growth, though, in a few stands, the Lamey method is used. Stripping, as in Algeria, begins in mid-June and ends in mid-August. In neither Algeria nor Morocco are the Cork Oak stands intensively managed, as in Portugal.

[2154]. 34.24 (61) : 12.26–8 : 98.3. [LIMA, H. P. DE] A produção de cortiça na África do Norte. **[Cork production in North Africa.]** *Bol. Junta nac. Cortiça, Lisboa* 9 (108), 1947 (613–5). [Port.]

A short history of the cork industry in North Africa, with figures for Moroccan exports for the years 1938–44 and French imports for 1945.

[2155]. 34.24 : 12.26–8. NATIVIDADE, J. V. Sobre a ocorrência de formações esclerosas (nails) no tecido suberoso do sobreiro. **[On the occurrence of sclerotic formations (nails) in the corky tissue of *Quercus suber*.]** *Bol. Junta nac. Cortiça, Lisboa* 10 (109), 1947 (5–13). [Port.]

[2156]. 34.24 : 12.11.11. KURTH, E. F. **The chemical composition of barks.** *Chemical Reviews, Baltimore* 40 (1), 1947 (33–49). 83 refs. O.R.S.

Bark analyses and components are tabulated and discussed. The standard wood-analytical procedures for lignin and cellulose are often inadequate when applied to barks. The lignin fraction from barks usually contains materials low in methoxyl and, in some instances, in carboxyl groups. There is evidence that the carbohydrate fraction in certain barks is chemically bound to the lignin fraction by bonds absent in wood. Barks contain hemicelluloses and cellulose; the sugars associated with the hemicelluloses are glucose, galactose, mannose, arabinose, and xylose, whereas the cellulose may have a large percentage of the alkali-resistant α-cellulose. Chemically, little is known about the cork in barks. Numerous compounds have been isolated from bark extractives; these include representatives of the alkaloids, sterols, and various alcohols, esters, glucosides, hydrocarbons, mucilages, proteins, saponins, sugars, tannins, and many types of acids and pigments. Ash and N contents and the B.Th.U. value of barks are higher than for wood. Some actual and suggested uses for barks are discussed. The article is a review of literature on barks up to 1945. *From author's summary.*

[2157]. 34.24 : 12.25 : 33.37–8. EULER, H. VON, HASSELQUIST, H., and LÖÖV, U. Pyrolytische Versuche mit Fichtenrinde. **[Experiments on the pyrolysis of Spruce bark.]** *Svensk PappTidn.* 50 (11*b*), 1947 (86–90). 22 refs. [G.g.] [Stockholms Högskola, Stockholm.] D.S.I.R.

Reviews briefly previous literature on the chemical composition of bark and describes and tabulates the results of experiments comparing the percentage of different fractions of Spruce bark obtained by extraction (with water and alcohol) and by different methods of destructive distillation: (1) in its simple form; (2) with the addition of various substances—Na_2SiO_3, glacial acetic acid, water or $Ca(OH)_2$; (3) after previous extraction of the bark with water. The nature and quantity of the fractions obtained were found to vary with the methods used.

34.25. Christmas Trees. Medicinal and Edible Plants

See also *For. Abstr.* 10 (Nos. 1815–6, 1853, 2174, 2180, 2186–8, 2299).

[2158]. 34.25 (470). BULYSHEV, I. A. **Dechlorination by substances of plant origin.** *Gigiena i Sanitariya* 11 (10), 1946 (13–7). *Chem. Abstr.* 41, 1947 (4875). P.R.

Superchlorination followed by dechlorination of the water by means of leaves of Oak and Birch, fruit and stem of Sweetbriar, and needles of Pine and Cedar was used widely during the second World War to disinfect wells. The plant agents were in the form of an aqueous extract, green or dry leaves, or powder. Dechlorination was complete or practically so, and taste very little affected. About 10–15 mg.

of dry leaves were used for 1 mg. of Cl; extracts reacted at once, powder in 10–15 min.

[2159]. 34.25 (54) : 12.26–8 : 34.36. KRISHNA, S., and BADHWAR, R. L. **Aromatic plants of India. Part VI.** *J. sci. industr. Res., India* 7 (6), 1948 (101–16). D.S.I.R.

Describes briefly plants of the families Rutaceae and Simarubaceae, the majority of which are shrubs or trees, and discusses the value of their timber and fruit, the chemical properties of various parts of the plants, and their use for medical purposes, and for flavourings, perfumes and cosmetics.

[2160]. 34.25 (82) : 12.11.11. CODONI, J. C. Investigación de alcaloides en hojas, cortezas y maderas de especies forestales argentinas. **[Investigation of alkaloids in leaves, bark and wood of Argentine forest species.]** *Publ. tec. Direcc. for. Argent.* No. 9, 1947 (3–13). 5 refs. [Span.] P.R.

Alkaloids were found in 6 out of the 17 Argentine species analysed and the results tabulated. In *Aspidosperma* sp. (Guatambú Amarillo), *Ocotea* sp. (Canela Guaica Blanca) and *A. quebracho-blanco* (Quebracho Blanco) alkaloids were present in sufficient quantities to warrant further investigation.

[2161]. 34.25 : 12.26–8. LEPESME, P. Les *Holarrhena* et leurs propriétés thérapeutiques. **[The *Holarrhenas* and their therapeutic properties.]** *Rev. int. Bot. appl. Agric. trop.* 28 (305/6), 1948 (120–5). 20 refs. [F.] P.R.

Cf. *For. Abstr.* 10 (No. 1678).

[2162]. 34.25 : 12.26–8. VIGNOLI, L., DELPHAUT, J., and LIEUTIER, J. Recherches pharmacologiques sur l'extrait fluide de bourdaine. **[Pharmacological research on the fluid extract of *Rhamnus frangula*.]** *Annales pharmaceutiques françaises* 5 (9), 1947 (553–6). 9 refs. [F.] L.S.

[2163]. 34.25 : 12.26–8 : 12.11.11. PARIS, M. R., and MOYSE-MIGNON, H. Étude préliminaire du *Fagara xanthoxyloides* Lam. **[Preliminary study [of the chemistry and pharmaceutical properties] of *Fagara xanthoxyloides*.]** *Annales pharmaceutiques françaises* 5 (7), 1947 (410–20). 23 refs. [F.] L.S.

34.26. Resin. Turpentine. Oils. Gums. Latex, Dyestuffs, etc.

See also *For. Abstr.* 10 (Nos. 1595, 1667, 1900–2, 2115, 2159, 2186, 2188).

[2164]. 34.26 : 12.25 : 12.26–8. **[Experimental tapping of Sal and Blue Pine.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (9, 88–90).

Experimental tapping of Sal (*Shorea robusta*) for its dammar was started in Orissa and Dehra Dun in 1944. The statistical analysis of 1944 data shows maximum yields during Sept.–Nov. There is no relation between the yield of the resin and the girth of the tree. The upper blazes yield more resin than the lower, and fortnightly freshenings more than monthly ones. The results further indicate that, although the trees are not injured by tapping, their exploitation for resin does not appear to be remunerative, on account of the low yield. The turpentine from Blue Pine [*Pinus wallichiana*] is rich in pinene, which could be converted into camphor. Tapping experiments conducted in the Murree Hills, Punjab, have shown a very poor yield.

[2165]. 34.26 : 12.25 (438) : 07.7. SZCZERBAKOW, K. Prace w lesie przy pozyskiwaniu zywicy sosnowej. **[The resin tapping of Pine [*Pinus sylvestris*].]** *Wydaw. pomocn. tech.-gosp. Inst. Bad. Leśn., Kraków* No. 12, 1948. pp. 105. 9 refs. [Pol.]

This booklet is intended as a source of practical information for workmen engaged in resin-tapping and impresses on them the need for Poland to become self-sufficient as regards resin. It gives a popular description, with drawings and photographs, of the method of tapping and implements used; also the text of the Ministry of Forests' official instruction of July 1945 on the organization of resin-tapping in State Forests, according to which all Pine stands are to be tapped for 2 years before felling. All healthy trees above 20 cm. d.b.h. are to be tapped, except those fit for plywood or cabinet-making; trees fit for telegraph and telephone poles are to be tapped for one season only. Up to 4 channels per stem are allowed as follows:—one for 21–29 cm. d.b.h., 2 up to 40 cm., 3 up to 50 cm. and 4 above this. Single channels are 45 cm. broad, multiple channels and their interspaces are 15 cm. each.

The setting up of the crop starts on Feb. 15 and lasts till April 15; the tapping itself, which is done by making V-shaped grooves 4–5 mm. deep and of the prescribed width, begins by the end of April or early May and should end in October. Trees are freshened in the afternoon only, on alternate days if the tree is to be tapped for 2 seasons, and every day if it is to be tapped for only one season. Tapping is paid as piece work and tappers receive special training.

[2166]. 34.26 : 12.25 (439). MAZEK-FIALLA, K. Die österreichischen Harzungsverfahren in der ungarischen Harzgewinnung. **[Austrian resin-tapping methods in the Hungarian resin industry.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (21/22), 1948 (176–7). [G.]

Resin-tapping is a new feature in Hungarian forestry. In 1947 about 256,000 trees, chiefly of *Pinus sylvestris*, were being worked, and plans for 1948 envisage an expansion to about 400,000. The regions involved are Sopron, Vas, Zalá, Somogy and Tolna-Baranya. The only method used is the '*Wiener Hobel*' technique [see *For. Abstr.* 8 (No. 2657)]. Yields have been high (1·8 kg. per tree) compared with those from the same species in other countries, a fact which is attributed to both technique and a favourable climate. A further notable fact is that unskilled labour has been used with success. Owing to fears that in Hungary's relatively dry climate long tapping might encourage outbreaks of insect pests, tapping is confined to the 3–5 years before felling. No use has yet been made of stimulants, which, given a proper technique, might be expected to raise yields still higher.

[2167]. 34.26 : 12.25 (471). KALELA, E. K. Pihkomiskokeita pohjoisissa männiköissä. **[Resin-tapping experiments in northern Pine woods.]** *Acta for. fenn.* 52 (2), (1946) 1947 (1–39). 14 refs. [Fi.g.]

Experiments in Finnish woods between 61° and 62° 30′ N. lat., in 1943, showed that: (1) Resin yield was not markedly influenced by forest type (Cajander's system), and there appears to be no support for the frequent recommendations to confine tapping to dry sites. So far as the evidence goes, yields appear to be somewhat higher on the better sites. (2) Resin yield and tree diameter were strongly correlated. Trees with vigorous and normal crowns gave greater yields than trees with poor ones. (3) The position of the face (N. or S. aspect; variation in height above ground) had no significant influence on resin yield. (4) Trees whose resin yield is poor at the start of tapping, should be abandoned, especially if of small diameter, as their yield does not later improve. (5) Any effects of weather on resin flow must have been masked by other factors.

[2168]. 34.26 : 12.25 (75). FERGUSON, J. H. A. Hars- en terpentijnwinning in de U.S.A. **[Resin and turpentine production in the U.S.A.]** *Tectona* 38 (1), 1948 (3–11). 10 refs. [Du.e.]

Chiefly a review of recent work by the Southeastern For. Exp. Sta. on resin-tapping of Longleaf and Slash Pines, with special reference to the use of chemical stimulants and work on selection and breeding.

[2169]. 34.26 : 07.7 : 01.4. SHEARON, W. H., PATTON, E. L., and SHINGLER, G. P. **Continuous distillation of gum turpentine.** *Industr. Engng. Chem.* 40 (9), 1948 (1695–1702). 18 refs. P.R.

[2170]. 34.26 : 12.26–8. **[Resin from *Boswellia serrata*.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (9, 86–7).

The resin from *Boswellia serrata* gum-oleoresin was isolated and studied. It has a pale-yellow colour with a good lustre, but its low acid value precludes its use as a substitute for rosin in soap making and as a size. The glycerol ester of the resin gives a better performance than the parent resin in the manufacture of varnishes and as a base for plastics.

[2171]. 34.26 : 12.26–8 : 12.11.11. KOPACZEWSKI, W., DUPONT, G., JULIA, M., and BRODSKI. Contribution à l'étude des résines d'Euphorbiacées: I. Extraction et historique. II. Latex de l'*Euphorbia résinifera*. III. Résine de l'*Euphorbia balsamifera*. [**[Chemical studies] on resins of the Euphorbiaceae: I. Extraction and historical summary. II. Latex of *Euphorbia resinifera*. III. Resin of *E. balsamifera*.]** *Bulletin de la Société chimique de France* Nos. 9/10, 11/12, 1947 (909–11; 1068–73). 17 refs. [F.] O.R.S.

[2172]. 34.26 : 12.25 : 12.11.11. IWAI, M., and NISHIOKA, I. **Properties of the seed oil of Korean Fir tree.** *J. Soc. Chem. Ind. Japan* 48, 1945 (18). *Chem. Abstr.* 42 (16), 1948 (6140). P.R.

[2173]. 34.26 : 12.25 : 12.11.11. **[Juniper oil.]** *For. Res. India Burma 1945–6*, Pt. 1, [1947?] (82–3).

Ripe berries of *Juniperus macropoda* from 3 localities in Baluchistan were crushed and then distilled with steam. The yield of oil varied with locality, but the quality was the same. The oil contained about 60–70% pinenes, 30–35% oxygenated compounds including the sweet-smelling esters and alcohols, and a small amount of cadinene.

[2174]. 34.26 : 12.25 : 34.25. DANZEL, L. L'oxycèdre-cade. **[*Juniperus oxycedrus.*]** *Produits pharmaceutiques* 2 (8), 1947 (351–8). 24 refs. [F.] L.S.

Juniperus oxycedrus is described botanically, and its wood properties and the production of its essential oil by distillation, commercially and in the forest, are discussed. The properties of true Juniper tar oil are described, with methods of distinguishing it from the false oil (of Pine and other conifers). Formulae for its chief uses, in medicine and veterinary science, as a fungicide, an insecticide and a general antiseptic, are given.

[2175]. 34.26 : 12.25 : 12.11.11. BRIGGS, L. H., and SUTHERLAND, M. D. **The essential oil of *Phyllocladus trichomanoides*.** *Journal of organic Chemistry* 13 (1), 1948 (1–9). 18 refs. [Auckland University College, New Zealand.] O.R.S.

The essential oil from the leaves contains the following constituents. The winter oil:—α-pinene, dipentene, a possibly new tricyclic sesquiterpene, a second sesquiterpene (possibly calamene or cadinene), phyllocladene, and isophyllocladene. The summer oil:—α-pinene, myrcene, γ-terpinene, copaene, cadinene, a cadinol, phyllocladene, isophyllocladene, and an unidentified solid and liquid diterpene. *Authors' summary.*

[2176]. 34.26 : 12.26–8. PENFOLD, A. R. L'Eucalyptus: essence de l'Australie. **[The Eucalypts: an Australian genus.]** *Rev. int. Prod. colon.* 23 (227/228), 1948 (164–5). [F.]

A brief account of the essential oils derived from various Eucalypt species, the uses of these oils and the by-products of their distillation.

[2177]. 34.26 (624). GRINDLEY, D. N. **Investigations of some new Sudan seed oils.** *J. Soc. chem. Ind., Lond.* 67 (6), 1948 (230–1). 9 refs. P.R.

From *Celtis integrifolia, Chaetacme microcarpa, Trema guineensis, Boscia octandra, Zizyphus spina-christi, Grewia villosa, Chrozophora plicata, Dobera roxburghii.*

[2178]. 34.26 (81). BORGES, R. Oleaginosas alimentícias de Amazônia. **[Amazonian species producing edible oils.]** *Bol. Minist. Agric., Rio de J.* 33 (2), 1944 (89–94). [Port.]

Describes the properties of oils from the following trees and palms:—Patauá [*Oenocarpus bataua*], Bacaba [*O. bacaba*], Pracaxi [*Pentaclethra macroloba*], Castanha do Pará [*Bertholletia excelsa*], Caiaué[?], Tucumã [*Astrocaryum tucuma*], Miriti [?], Piquiá [*Caryocar villosum*] and Murumuru [?].

[2179]. 34.26 : 12.26–8 : 34.27. MARASCHINI, F. Sull'olio di semi di faggio. **[Beechnut oil.]** *Rivista italiana Essenze* 30 (3), 1948 (113). [It.] L.S.

An account of the investigations of Dr. Rinkoff of the University of Sofia Technological Institute. The shelled, dried kernel has an oil content of 40–42%, and a high protein content. The oil should be expressed cold, or at most at a temperature of 75°, or its flavour will be spoilt. The content of free acids is low (about 1%) and the oil keeps well. Average saponification and iodine numbers are 190 and 110 respectively. Analysis of oil from fresh kernels gave the following results:—

	%
Oleic acid	40·6
Linolic „	40·1
Linoleic„	2·2
Saturated fatty acids	11·4
Non-saponifiable	1·2
Residual	4·5

[2180]. 34.26 : 12.26–8 : 34.27 : 34.25 : 12.14.7 : 12.11.11. GONZALEZ GOMEZ, C., and PEREIRA, A. Investigaciones sobre las semillas de *Caloncoba mannii* (Oliv.) Gilg de la Guinea Española. **[Investigations on the seeds of *Caloncoba mannii* (Oliv.) Gilg from Spanish Guinea.]** *An. Jard. bot. Madrid* 6 (1), 1945 (110–22). 22 refs. [Span.] O.B.D.

A study of the morphology, histology and chemical composition of the seeds of *Caloncoba mannii*, source of an oil with anti-leprous properties.

[2181]. 34.26 : 12.26–8. AIRAN, J. W. **Oil from the seeds of *Zizyphus xylopyra* [sic] (Willd.).** *Curr. Sci.* 17 (5), 1948 (150). **[Rajaram College, Kolhapur.]** A.P.B.

[2182]. 34.26. METCALFE, C. R. **Lesser rubber plants.** *Research* 1 (10), 1948 (439–46). 10 refs.

A brief account of the various climbers and herbaceous plants used for rubber production during the war, with a fuller description of kok-saghyz (*Taraxacum kok-saghyz*) and its allies, their cultivation, rubber content, estimation and distribution, preparation and properties of rubber samples.

[2183]. 34.26 (81). CHEVALIER, A. Nouvelles plantes à caoutchouc du nord du Brésil. **[New rubber plants from northern Brazil.]** *Rev. int. Bot. appl. Agric. trop.* 28 (309/10), 1948 (364). P.R.

Notes on *Couma rigida*, *Macoubea guianensis*, *Lacmellea pauciflora* and *Tabernaemontana* species.

[2184]. 34.26 (81). BONDAR, G. Arvores lactíferas na Bahia e nova indústria extrativa de gomas. **[Latex-yielding trees of Bahia and the new gum-extracting industry.]** *Bol. Inst. Fom. econ. Bahia* No. 16, 1948. pp. 43 + [1] + 13 photos + 5 drawings. 15 refs. [Port.]

The most important Bahian trees producing latex for chewing gum are Mucuguê (*Couma rigida*), Piquiá (*Macoubea guianensis*), Chananão (*Lacmellea pauciflora*) and Pán de Culher (*Tabernaemontana* sp.). The bulletin contains a botanical description of these species, notes on their distribution in Bahia, and information on methods of tapping the latex and processing it for chewing-gum manufacture.

[2185]. 34.26 : 12.26–8 (82) : 31.3. CODONI, J. C., and VALENTE, H. M. Contribución al estudio químico y aplicación de nuestros árboles: El guayabí (*Patagonula americana*). **[Contribution to the chemical study and utilization of our trees: Guayabí.]** *Publ. tec. Direcc. for. Argent.* No. 9, 1947 (17–24). 7 refs. [Span.] P.R.

A chemical analysis was made of the wood of *Patagonula americana*. Extraction of the heartwood with ether or alcohol produced a dye suitable for staining wood.

34.27. Seeds. Fruits. Fibres and Flosses

See also *For. Abstr.* 10 (Nos. 1733, 2177–81).

[2186]. 34.27 : 12.26–8 (679) : 34.25 : 34.26 : 98.3. JORDAN, C. C. **The Cashew nut in Mozambique.** *Foreign Agric.* 12 (7), 1948 (156–9). E.M.B.

The Cashew tree (*Anacardium occidentale*) and its numerous products are described. About nine-tenths of the Cashew trees in Mozambique are cultivated; plantations have increased in the last 25 years, the principal plantation areas being Nampula and Porto Amelia. The total annual production of the colony is estimated at 50,000 to 80,000 tons, much of which is wasted for lack of a market, exports having declined steadily since 1940. Processing of the nuts has not been developed in Mozambique because of the lack of skilled labour.

[2187]. 34.27 : 12.26–8 : 12.11.3 : 34.25 (81). SEIBERT, R. J. **The uses of *Hevea* for food in relation to its domestication.** *Ann. Mo. bot. Gdn.* 35 (2), 1948 (117–21). 9 refs. O.B.D.

The domestication of *Hevea* as a food plant by the Indians of the Rio Negro region of the Amazon valley probably played an important part in the production of interspecific hybrids. For example, the high degree of variability in *H. pauciflora* may be due to its being preferred and most often domesticated as a nut tree. The author points out that *Hevea* seeds could provide valuable by-products in the form of oil, fertilizer and cattle food in rubber plantations.

[2188]. 34.27 : 12.26–8 (662) : 34.3. CHEVALIER, A. Nouvelles recherches sur l'arbre à beurre du Soudan, *Butyrospermum parkii*. **[Recent research on the Shea Butter Tree.]** *Rev. int. Bot. appl. Agric. trop.* 28 (307/8), 1948 (241–56). 8 refs. [F.] P.R.

A botanical description, with discussion of the tree's importance in the economy of the Sudan, both for export of the nuts and butter and for its use by the natives for food, timber and as a honey crop. Improvements should be made by grafting but will necessarily be slow.

[2189]. 34.27 : 12.26–8 (666.8) : 12.11.21 : 43.3. SERVILLE, R. Le kapokier en A.O.F. **[*Ceiba pentandra* in French West Africa.]** *Rev. int. Prod. colon.* 23 (229), 1948 (171–4). [F.]

The author gives some account of his 20 years' experience in raising and managing Kapok plantations on the Ivory Coast. He attributes the general failure of such plantations

(1) to inadequate pollination, (2) to damage by brush fires. He found that when he placed hives of bees in his plantations (1 to every 200 ha.) the crop of pods in the following season was doubled. This expedient had to be given up, because the natives came by night to smoke out the bees and steal the honey, destroying both swarms and hives. There are never likely to be sufficient wild bees to fertilize dense pure plantations. He guarded against the danger of fire by getting the natives to clean hoe the ground and plant crops of maize and sorghum. His final conclusion is that large pure plantations of Kapok are not economically attractive for Europeans, but that native cultivators might profitably plant small groups of these trees about their fields.

34.28. Osiers. Bamboos

See also *For. Abstr.* 10 (Nos. 1713, 1954, 2083–4, 2131, 2143).

[2190]. 34.28 : 12.26–8 (436). KRICKL, M. Beiträge zur Korbweidenkultur und ihre staatliche Förderung in Österreich. **[On Osier cultivation and its encouragement by the State in Austria.]** *Cbl. ges. Forstw.* 70 (3/4), 1947 (293–331). 14 refs. [G.] [Bundesanstalt für Pflanzenbau und Samenprüfung, Vienna.]

A survey of the history of Osier cultivation and its encouragement by successive governments in Austria; soil requirements of Osiers; their propagation by cuttings; future tasks in breeding; steaming and peeling of rods; loss of weight by unpeeled green rods during drying; use of Osiers in living barrages and other stream-improvement work; possibilities of Osier-growing at high altitudes; and the status of Osier-growing in Austria since 1938.

[2191]. 34.28 : 12.29 : 31.27 : 32.24. LIMAYE, V. D. **Effect of age and season of felling on the strength properties of Bamboo.** *Indian For.* 74 (1), 1948 (17–18).

Both young and mature Bamboos [*Dendrocalamus strictus*] were felled in December (cold season) and May (hot season), and their strength tested both green and kiln dried. The tentative conclusion is drawn that Bamboos felled in the cold season are generally stiffer and stronger than those felled in the hot season, and that mature Bamboos are 40–50% stronger and stiffer than young ones in either season. *From author's summary.*

[2192]. 34.28 : 12.29 (51) : 38.2 : 31.0. ROUDAKOFF, G. Note sur les constructions en bambou. **[Building construction in Bamboo.]** *Bulletin de l'Université l'Aurore* (*Shanghai*). 8 (3), 1947 (418–28 + dgms.). 16 refs. [F.] O.G.

A short account of the constructional uses of Bamboo in China. The tables include the following information:—(1) Principal species used, with locality, average height and diameter; (2) shrinkage of *Sinocalamus affinis* and *Phyllostachys edulis*; (3) mechanical properties of Bamboo as determined by 3 Chinese and one American technological institute; (4) French, English, and Chinese terms for the more important constructional elements.

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

See also *For. Abstr.* 10 (Nos. 1658, 1991).

[2193]. 35 : 09.4 : 98.2. **Yearbook of forest products statistics.** Food and Agriculture Organization of the United Nations, Washington, D.C. 1948. pp. 209. [E.F.]

[2194]. 35 : 09.4 : 98 : 33.32. **Timber statistics, January–March, 1947 and 1948.** *Quart. Bull. FAO.* 1 (1), 1948. pp. 39. [E.F.]

Tabulates for all available countries or regions, their output and stocks, sales and purchases, exports and imports by main categories of timber.

[2195]. 35 (437) : 98.3 : 09.4. Bilance československého vývozu a dovozu dříví za rok 1947. **[Balance of Czechoslovakian exports and imports of wood, 1947.]** *Lesn. Práce* 27 (3), 1948 (105–7). [Cz.]

[2196]. 35 (471) : 98.1 : 09.4. ERKKILÄ, E. E. Maaseutuväestön puunkäytön kokonaismäärä ja sen kehitys. **[The total wood consumption of the rural population in Finland and its development.]** *Commun. Inst. for. Fenn.* 32 (1), 1943 (1–375). 162 refs. [Fi.g.]

[2197]. 35 (73) : 98.1. MERRICK, G. D. **Trends in distribution of lumber [within the U.S.A.], 1922–1943.** *Sth. Lumberm.* 177 (2218), 1948 (56, 58, 60, 62). 7 refs.

[2198]. 35 (931) : 98.3 : 12.25. WARD, W. C. **New Zealand's export timber trade.**

Aust. Timb. J. 14 (5), 1948 (309, 311, 313, 315, 340).

Current production of timber in New Zealand and present and future exports are discussed. Within a short time exotic species, chiefly *Pinus radiata*, are expected to replace indigenous species as timber producers. South Island exotic forests are not likely to do more than supply a domestic deficiency of native timbers, but the vast exotic forests of North Island should, over a space of time, yield an increase in production well in excess of domestic requirements. A conservative estimate indicates a possible rise in *P. radiata* exports from 10 million bd. ft. in 1948 to 45 million bd. ft. in 1952. Lack of shipping is likely to be a limiting factor, however, and a system of quotas for sawmills, based on current production, will be desirable. The author emphasizes the need for establishing now a high standard of sawing and grading, and for reducing production costs in order to prepare for future competition in a buyer's market.

38. CONSTRUCTIONAL WORKS. ENGINEERING

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 10 (Nos. 2116–27, 2192).

[2199]. 38.2 : 02.1 : 31.27 : 33.4 : 33.15.2 : 33.5 : 33.91. HANSEN, H. J. **Timber engineers' handbook.** John Wiley & Sons Inc., New York. Chapman & Hall Ltd., London. 1948. pp. 882. Price $10.00 (£3.0*s.* 0*d.*).

The handbook summarizes in a single volume all the most up-to-date information necessary for designing wood structures. It consists of chapters under the following heads:—factors affecting the strength of timber, grading rules and working stresses, standard terms and abbreviations, sizes and properties of sections, weights (of timber, other materials, roof coverings, nails, bolts, connectors, etc.), loadings, simple beams, continuous beams, trussed beams, solid columns, spaced columns, combined stresses, fastenings, trusses, glued laminated construction, plywood, floor systems, buildings, poles and piling, protection and maintenance. A table of uniformly distributed loads for spans from 3 ft. to 50 ft. is included.

[2200]. 38.2. SELMAN-TOWT, G. **Nailed and glued wooden construction—some new types as result of research.** *Transl. Inform. Serv. Coun. sci. industr. Res. Aust.* [*n.d.*] pp. 23 + iii. 18 refs. *Transl.* by H. Brosenius from *Teknisk Tidskrift, Väg- och Vattenbyggnadskonst och Husbyggnadteknik, Stockholm* 73 (6), 1943 (81–96). P.R.

[2201]. 38.2 (471). SAVOLA, U. E. Träsproduktionen i Finland. **[The manufacture of wooden houses in Finland.]** *Teknisk Ukeblad* 93 (45), 1946 (618–22). [Nor.] L.S.

An illustrated description of different types with particular reference to the construction of the walls, their insulating properties and the maintenance of heat in winter.

[2202]. 38.2 : 33.4. LUCAS, E. **Tackling the builder's post-war problems. (3). Saving timber.** *Ill. Carp. Build.* 137 (3706), 1948 (1022–3). P.R.

[2203]. 38.2 : 33.4 : 31.2 : 33.36.1. BATESON, R. G. **The economy of timber in building.** Crosby Lockwood & Son Ltd., 39 Thurloe St., London, S.W.7. 1948. pp. xi + 96. Many refs. Price 7*s.* 6*d.*

Contains chapters on the uses of timber in building, its properties and preservation, suggestions for design in planning a small semi-detached house, the use of timber in joinery and decorative work, how to allocate one standard (= 165 cu. ft.) in a house of 1,000 sq. ft. floor area, substitutes for timber in houses and the future of timber in the building industry.

[2204]. 38.2 : 33.4. DUHOUX, M. Les cintres en bois pour ouvrages d'art. **[Wooden centering for permanent structures.]** *Ann. Inst. tech. Bâtim. Trav. publ., Paris* (*n.s.*). Nos. 17, 1948, pp. 35; 18, 1948, pp. 31. 30 refs. [F.] D.S.I.R.

A detailed illustrated description of different types of wooden centering, including individual examples erected in France in recent years, which have proved satisfactory, with instructions and tables for calculating design and strength.

[2205]. 38.2 : 31.27. GREEN, N. B. **Lessons taught by wood-truss failures.** *Engng. News-Rec.* 13 (18), 1947 (87–9). D.S.I.R.

Analyses causes of failure of several split-ring connector joints of timber trusses and concludes that some modification in methods of calculating the allowable load are necessary. Concentric installation of 4-in. split rings on opposite faces should not be allowed on members less than 2⅝ in. thick and a low tensile working stress should be used for calculating the required net section at connector joints.

38.3. *Road and Bridge Construction*

See also *For. Abstr.* 10 (No. 1957).

[2206]. 38.3 (485) : 32.2. ELGSTRAND, A. Beskrivning av vägnätet på en drivningstrakt i Norrbotten. **[Description of the road network on a logging area in Norrbotten.]** *Norrlands SkogsvFörb. Tidskr.* 1946 (1), (99–106). 3 refs. [Sw.] (*Medd. Fören. Skogsarbet. K. Domänstyr. ArbetsstudAvd.* No. 26.)

Illustrates and discusses a lay-out planned to facilitate '*stränghuggning*'—a system of logging under which the woodcutters, besides their usual felling and crosscutting work, reconnoitre and clear the skidding roads, and drag to these the timber that they fell.

[2207]. 38.3. BITTERLICH, W. Über Planung und Bau von Holzbringungswegen im Hochgebirge: praktische Winke und Anregungen. **[On the planning and construction of extraction roads in the high mountains: practical hints and suggestions.]** *Cbl. ges. Forstw.* 70 (3/4), 1947 (236–69). 6 refs. [G.]

A summary of well tested practical advice.

[2208]. 38.3. DUHM, J. Neuzeitliche Erdstrassen. **[Modern earth roads.]** *Cbl. ges. Forstw.* 70 (2), 1947 (97–114). [G.]

Expounds the theory of the effects of mechanical composition and other soil properties on the bearing capacity of earth roads, and the use of simple or mixed amendments (clay, sand, gravel) designed to correct the mechanical composition to that giving maximum road stability in all weathers. Describes soil tests and calculations of suitable amendments based on shingle (as the only readily available local material) for a road in an Austrian forest. The building of a test stretch in 1945 was prevented by war. Notes are included on some practical points in road improvement, e.g. preparatory work, form of profile, mixing the materials, compacting, and the cardinal importance of proper maintenance.

[2209]. 38.3 (73) : 76. HOLDER, W. **Bituminous surface of main log hauling roads.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 988 (B–8–6), 1948. pp. 4 + 2 tbls.

Analyses costs of construction and savings on maintenance, with reference to prices and conditions in the U.S.A.

[2210]. 38.3 : 32.91.22. KHEYFETS, I. S., and KARAVAEV, V. I. Avtolezhevnye dorogi s perenosnym verkhnim stroeniem dlya vremennykh usov. **[Plank motor-truck roads with a portable superstructure for use in temporary spur roads.]** *Lesnaya Prom.* 1948 (6), (6–7). [Russ.]

Gives constructional details of plank roads consisting of:—(1) A foundation of longitudinal members (varying in number with the firmness or bogginess of the ground) on which are laid cross-members acting as sleepers. The whole of this foundation is made of low-grade round wood and may be either left in the forest or extracted and converted when its purpose has been served. (2) A portable deck, made in 6-m. lengths, of 2 plank tracks (one for each truck-wheel) with an open lane in the middle to economize in timber. Use of such roads should considerably reduce the horse-skidding phase, which is considerably more expensive than the truck phase of transport.

38.5. *Construction of Hydraulic Works*

[2211] 38.5 (485). HOLMGREN, A. Flottleden Dalälven-havet. **[The Dalälv—Gulf of Bothnia floating channel.]** *Norrlands SkogsvFörb. Tidskr.* 1948 (1), (1–76). Many refs. [Sw.]

Reviews the history of this flume and canal link, with special reference to economic effects, opposition encountered, and legal aspects.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

See also *For. Abstr.* 10 (No. 1599).

42.1. *Air Currents*

See also *For. Abstr.* 10 (No. 2295).

[2212]. 42.1 (473). TIMOFEEV, V. P. Vetroval i burelom v lesnoy opytnoy dache TSKhA v sentyabre 1943g. **[Windthrow and storm breakage in the experimental forest of the Timiryazev Agricultural Academy in September 1943.]** *Dokladȳ, Moskovskaya Ordena Lenina sel'skokhozyaystvennaya Akademiya imeni K. A. Timiryazeva* No. 3, 1946 (51–5). [Russ.] C.G.B.

Discusses the extensive damage caused by windthrow, and to a lesser extent by wind breakage, in storms of Sept. 23–4, 1943 and May 27, 1944. The greatest damage occurred in exposed situations, in excessively opened stands and in stands that had previously suffered from drought and frost. Windthrow was commonest on damp low-lying sites with gleying and a compacted B horizon not far below the soil surface. Here the tree roots were crowded in horizontal fans at a depth of 60–90 cm., and owing to drought years the roots in the compacted B horizon were mostly dead (84%), thus affording little anchorage. All the chief species (Scots Pine, Siberian and European Larches, Norway Spruce, Birch, Oak and Lime) suffered from windthrow, which may be regarded as one of the agents in natural selection and to some extent as an indication, in plantations, of mistakes in choice of species or treatment.

42.2. *Temperature Influences*

See also *For. Abstr.* 10 (Nos. 1567, 1660, 1752).

[2213]. 42.21 (489). PALUDAN, H. **Winter damage to trees, shrubs. perennials and bulbous plants [in Denmark] in 1946–47.** *Aarsskr. Vet.-Landbohøjsk.* 1948 (64–100). [E.]

Briefly describes the weather of the winter of 1946–7 and lists species alphabetically, indicating for each the degree of injury sustained in comparison with that for the 1941–2 winter.

[2214]. 42.21 : 12.25 (775) : 21.0. STOECKELER, J. H. **Recovery of winter-injured conifers.** *Amer. Nurserym.* 88 (9), 1948 (9, 54).

Following severe frost damage in February 1948, when a period of abnormally warm weather was succeeded by a sharp and sudden frost, some 350 trees growing near Rhinelander, Wis., were labelled and kept under observation. It was found that species varied widely in their capacity to recover. White Pine [*Pinus strobus*] and Eastern Hemlock [*Tsuga canadensis*] made striking recoveries. White Pine trees which had had as many as 70–100% of the needles browned and killed in April showed good recovery by September. The results of observations on a number of native and exotic species are summarized in a table. On the whole, damage was more severe and lasting in exotics than in native species, in planted trees than in wild ones of the same species, in trees 4–10 ft. high than in larger trees, and in recently planted than in well established trees. Conifers with partial shade or protection on the south side often showed less injury than those completely in the open. The zone of maximum foliage injury, especially on Spruces and Firs, was the foot or two just above the snow line, where reflected sunlight aggravated the injury.

European species showed extreme variability in needle browning, bud kill, and survival. Norway Spruce and Scots Pine of N. European origin (especially Sweden, Norway, Finland, and N. Russia) suffered comparatively little winter injury, those of central or S. European origin had moderate to severe damage. [Cf. *For. Abstr.* 10 (No. 1620).]

[2215]. 42.22 (437). PFEFFER, A., ŠKODA, B., and ZLATUŠKA, K. Vliv sucha v r. 1947 na lesní dřeviny. **[The effect of the 1947 drought on forest trees.]** *Lesn. Práce* 27 (6), 1948 (193–214). 10 refs. [Cz.f.russ.]

Reports on drought damage observed up to the end of March, 1948, in the forest of Kostelec and Černymi Lesy, with regard to altitude, aspect, soils and species. Norway Spruce the most seriously affected, showed

most damage in young growth, especially that under shelterwood or in mixed stands (root competition), at the margins of stands, and in places normally having a moist soil. In 30- to 40-year-old stands losses increased with degree of suppression. In old Spruce, individual trees died in the centre of stands, and on sunny margins rather more considerable losses occurred. Old trees in mixture with hardwoods frequently succumbed to root competition. Little beetle attack has been noticed as yet, but an increase is probable in 1948. Scots Pine, Silver Fir and the hardwoods have suffered little. Among exotics, *Pseudotsuga taxifolia* var. *viridis* proved drought-resistant, but *Pinus strobus* was in many places as severely damaged as Spruce. On the whole, the damage in this forest is counted as slight. [Cf. *For. Abstr.* 10 (Nos. 2264, 2294).]

42.3. *Precipitations*

See also *For. Abstr.* 10 (No. 1808).

[2216]. 42.31 (494) : 11.62. KUSTER, A. Der Einfluss der Juraseen-Hochwasser auf die Strandwaldungen. **[The influence of flooding on woodlands along the banks of the Jura lakes.]** *Schweiz. Z. Forstw.* 99 (8), 1948 (428–38). [G.g.f.]

The zone liable to floods round the lakes of Neuchâtel, Murten and Biel, bears thriving woods of 'Canadian' Poplar, Ash, Birch, and Common and Grey Alders, which are mostly treated as coppice with standards. Their growth and vigour is determined not by the occasional flooding, but by the average and minimum lake and groundwater levels. Winter flooding has apparently never been detrimental to the woods, and the much rarer summer flooding (that of 1910 being the only one of any scale and duration) has left no considerable traces of damage. Reliable reports, however, indicate that groups and individual trees of Norway Spruce, Ash, Maples and Cherry, in low-lying ground where the water remained for a long time, were either temporarily affected or in some cases killed by the 1910 floods. Some sporadic cases have been noted of erosion of wooded banks by combined high water and wave action, but this type of damage would have been much more serious in the absence of trees to stabilize the banks.

42.5. *Chemical Influences. Nutrient Deficiencies*

See *For. Abstr.* 10 (Nos. 1729–30).

42.6. *Electrical and Cosmic Influences*

[2217]. 42.61 : 41 : 23.27. **Installing lightning protection on trees.** *Trees, Cleveland (Ohio)* 8 (5), 1948 (16, 18, 28).

43. FOREST FIRES

See also *For. Abstr.* 10 (Nos. 1805, 1813).

43.0. *Predisposing Factors and Causes*

See also *For. Abstr.* 10 (No. 1567).

[2218]. 43.0 : 01.4 (714). VILLENEUVE, G. O. Méthode d'évaluation des dangers d'incendie forestier dans la province de Québec. **[Method of rating forest-fire danger in the Province of Quebec.]** *Bull. Bur. Met. Québec* No. 7, 1948. pp. 61 + [7]. 6 refs. [F.]

A detailed account of the Wright-Beall system of measuring forest-fire hazard, as modified and used by the Quebec Forest Service.

[2219]. 43.0 : 01.4 (714). VERRET, M. L'indice d'inflammabilité des forêts en rapport des incendies forestiers en 1946. **[Index of inflammability of forests in relation to forest fires in 1946.]** *Bull. Serv. Prot. Québec* No. 9, 1947. pp. 18. [F.]

In order to test the efficacy of the Wright-Beall index of inflammability for fire-hazard rating, a detailed study was made of 980 out of the 992 fires which occurred in Quebec in 1946; these were analysed with reference to the nature of the stands, date and cause of fire, number of man-hours necessary for control, duration, and area burnt. It was found that 74% of fires originated in stands cut over within the previous 5 years. The greatest number of fires occurred during August (23·4%) and September (23·1%). Human agency, more or less immediate, was found to be the cause in 85% of fires. Almost all fires (97·8%) began as slash or grass fires. A direct

correlation existed between height of inflammability index and number of man-hours required to control a fire, duration, and area burnt. More than ⅔ of the fires occurred when the index was above 9.

[2220]. 43.01 (431–5). GEIGER, R. Neue Unterlagen für eine Waldbrandbekämpfung. II. Teil: die Witterungsbedingungen für Waldgrossbrände. **[New basis for a campaign against forest fires. Part II: weather conditions for forest fires.]** *Mitt. Reichsinst. Forst- u. Holzw., Hamburg* No. 5, 1948. pp. 11. 10 refs. [G.e.f.span.] P.R.

An analysis of weather conditions prevailing during 298 forest fires, covering: general weather conditions; dryness, on the day of the fire and 5 and 10 days previously, and the long-range drying process; other meteorological elements—relative air humidity, maximum air temperature, wind velocity, and the correlation of all 3—on the day of the fire and the previous day. Data are recorded in graphs and tables. The chief contributory weather factors are found to be high day and night temperatures, dryness of the air and lack of rain, all of which obtain during a spell of high-pressure weather conditions, plus the high wind which occurs as the high-pressure conditions disperse; weather maps confirm that forest fires are most frequent at times immediately following a spell of high pressure.

43.1. *Protective Measures (including Controlled Burning)*

See also *For. Abstr.* 10 (Nos. 1588, 1747–8, 1949).

[2221]. 43.1 : 07.7. DAVIS, W. S. **Higher helicopter's limits.** *Fire Control Notes* 9 (4), 1948 (37).

One of the factors limiting the use of helicopters for fire control operations in the Rocky Mountains has been their low operational ceiling (about 3,000 ft. above sea level at summer temperatures) [cf. *For. Abstr.* 8 (No. 2801)]. The U.S. Geological Survey has been operating a Bell 47 D (specifications given) from Canon City, Colo., where the airport itself is at 5,500 ft., up to altitudes of 10,000 ft. The Bell Aircraft Co. now have a machine undergoing tests, which will have a service ceiling of 20,000 ft. above sea level.

[2222]. 43.11 : 07.7 : 32. **Spark arresters for motor equipment.** *Timberman* 49 (12), 1948 (66, 68).

The Department of Mechanical Engineering of Idaho University has evolved a design for a spark arrester for the type of tractor used in logging operations. The development of a thoroughly efficient arrester to minimize fire hazard is of great importance, and the Department is making further tests on a large number of designs.

43.3. *Fire Damage*

[2223]. 43.3 : 12.11 : 11.11 : 12.25. BYRAM, G. M. **Vegetation temperature and fire damage in Southern Pines.** *Fire Control Notes* 9 (4), 1948 (34–6).

It has long been known that Pine stands in the southern United States are more severely damaged by late spring and summer fires than by winter fires. The usual explanations are that a stand is most susceptible to fire injury during the growing season, and that summer fires are hotter than winter fires. As a result of a theoretical analysis of the factors contributing to fire damage, the author suggests that other factors may be considerably more important. (1) The initial vegetation temperature may be the most important of these. The lethal temperature for plant tissue is about 140° F. The temperature of the foliage of a Pine in bright sunlight may exceed 105°, whilst in a cold period in winter it might be only 35 or 40°. Therefore an increase of only 35° would be required to reach lethal temperature in the one case and 100° or more in the other. Thus a fairly intense fire in winter might do no more damage than a low-intensity fire in hot summer weather. Theoretical curves show the relative fire intensities that Longleaf, Slash, and Loblolly Pine should tolerate at different temperatures. The most noticeable feature of the curves is the sudden increase in a Pine's heat tolerance at temperatures below 29°. At this temperature, since most of the water in the needles and buds would be frozen, large quantities of heat would be required to convert the ice back to water.

(2) Another important factor is the morphology of the needles, buds and branch endings. The rate of temperature rise in these susceptible parts is inversely proportional to their size. This may explain why suppressed trees, the

susceptible parts of which are dwarfed and of small volume, are more easily killed by fire than vigorous trees of the same size. It may also explain why Longleaf Pine is less susceptible to fire than other Pines. The bud diameters of Longleaf, Slash, and Loblolly Pine are 1·16, 0·72, and 0·33 cm. respectively, and their fire susceptibility is inversely proportional.

(3) Wind is another important factor affecting the temperature of vegetation exposed to radiant heat. It is difficult to compare the relative importance of wind and temperature, because their effects are interrelated. In a headfire, wind increases the fire intensity by speeding up the combustion process. This is partially offset by turbulence, which retards the upward flow of heat, and by the conductive cooling effect of the wind on buds and needles, which reduces the rate of temperature rise.

Basic studies are now in progress on the Francis Marion National Forest to obtain experimental checks on the results of the theoretical work discussed in this paper.

[2224]. 43.3 : 31.8 : 12.26–8 (778). POGUE, R. **Effect of woods burning on lumber recovery.** *J. For.* 46 (9), 1948 (689–90).

Black, Red, and White Oak lumber cut from 5 tracts of annually burned hardwood forest in the Missouri Ozarks yielded only 3% of F A S grade (clear lumber, commonly called 'first and seconds') and the average value of the lumber produced was $37.57 per 1,000 bd. ft. stacked at the mill. Corresponding figures for lumber cut from a similar tract that had never been burned, were 30% and $57.75. The nature of the defects found in lumber from burned-over areas is indicated. Almost the only defect in that from the unburned tract was sound knots in boards sawn from top logs.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

See also *For. Abstr.* 10 (Nos. 1811, 1822).

[2225]. 44.1 : 07.7. ASPENGREN, H. **Något om klorex. [Notes on Klorex (sodium chlorate).]** *Svenska SkogsvFören. Tidskr.* 46 (1), 1948 (25–8). [Sw.]

A complete kill of luxuriant weed growth composed of perennial herbs and grasses cannot be achieved with economically reasonable dosages of $NaClO_3$, but the ground can be effectively cleared for at least a year by smaller applications. Spreading of the dry salt, whether by hand or by a special apparatus, gave uneven distribution and a high consumption of the salt [but cf. following abstract], whereas spraying was satisfactory in both respects. A saturated solution (0·75 kg./l.) is to be preferred. Rates of application differ with species, e.g. about 100 kg./ha. are needed for *Rubus idaeus*, *Epilobium angustifolium* and *Urtica dioica*, 150–175 for *Spiraea ulmaria*, and higher rates for ferns and tufted grasses, to secure one growing season free of weeds. The spray should be directed to the stem base and roots. Though most effective in spring, spraying is better done in autumn, as planting can take place in the following spring and the advantage be gained of a weed-free growing season. Weeding in the following seasons remains a problem, to be met possibly by hand weeding for a restricted distance round the plants. Some preliminary trials have been made of spraying chlorate in a ring, 50 cm. broad, outside a circle 50 cm. in diam. in which the plant and its root system were protected by a cover. These trials are to continue with a special ring-spraying apparatus, which is illustrated diagrammatically. It is believed that a single treatment with this sprayer may save 2–4 hand weedings. Only small quantities of solution of low concentration should be required. [Cf. *For. Abstr.* 10 (No. 1743).]

[2226]. 44.1 : 07.7. LENNGREN, C. E. En motordriven pulverspridare. **[A motor-driven dusting machine [for applying sodium chlorate].]** *Svenska SkogsvFören. Tidskr.* 46 (1), 1948 (29–32). 3 refs. [Sw.]

In view of the limitations of spraying as a means of applying chlorates, imposed by the problem of water supply, relatively complicated apparatus and restricted range of the spray, the author designed a motor duster [no constructional details are shown] which proved very successful under field conditions in the autumn of 1947. It is driven by a 2-stroke petrol engine and has a high-pressure fan into which the dust is introduced by a screw feed along the fan axis. The rate of feed can be regulated. The most important part is the

nozzle, which must effect a uniform spread of dust over as broad a belt as possible. The nozzle is so designed that it ejects 3 main streams—a lesser central one directed backwards, and two larger streams (each again divided into two) at an angle, to give width. Owing to centrifugal separation inside the nozzle the central stream consists of smaller particles while the lateral streams are of larger ones to secure the necessary range. The machine gives a reasonably uniform spread of the dust over a belt 15 m. wide, but enough dust is deposited outside this belt to be effective if an overlap is secured by making successive runs at a spacing of 17 m. In spite of the relative hygroscopicity of the dust, the feed screw effectively reduced any lumps. No wear on the fan was observed in the numerous trials. The maximum output is 300 kg. of dust per hour. Going at 3 km./hour and in lines 15 m. apart, the performance is about 4·5 ha./hour at a rate of 67 kg./ha. The chlorate container holds 100 kg. and the fully charged machine weighs 200 kg. In the form used it was mounted on a skidding sledge drawn by one horse and carrying a reserve stock of chlorate. Though undertaken in a drought period, the trials gave a good kill of heather and *Vaccinium*, probably owing to the occurrence of dews. The apparatus could also be used for applying other solids in dust form.

[2227]. 44.1 : 12.26–8 : 41 : 24.4. DEKATOV, N. E. Merȳ bor'bȳ s zarastaniem ploshchadey sel'skokhozyaystvennogo pol'zovaniya drevesnoy i kustarnikovoy rastitel'nost'yu. **[Control measures against the invasion of agricultural areas by trees and shrubs.]** *Priroda, Moskva* 36 (11), 1947 (68–70). [Russ.] A.C.P.

Deals with the problem of eradicating suckers of species such as *Robinia pseudoacacia, Populus tremula, P. alba, P. nigra, Alnus incana* and of shrubby species, e.g. *Corylus avellana, Prunus spinosa*, on agricultural land, especially that adjacent to shelterbelts. Counter-measures include: (1) Isolation of species that sucker by placing them in the middle of the belts or by cutting a trench between the belt and the fields. (2) Mechanical eradication: careful removal of roots in the topsoil; systematic cutting of suckers below the soil surface. (3) Chemical control, e.g. by poison girdling and/or spraying with chlorates.

Experiments showed that poison-girdling with sodium arsenite would kill parent stems of the trees involved within a few months, provided that complete girdling was effected at the root collar. This treatment prevented coppicing but only weakened suckering. The recommended concentration of sodium arsenite is 25%.

Trials were also made of spraying suckers of Aspen and Grey Alder with 2–3% solutions of the chlorates of Na, K and Ca. These proved greatly superior to other herbicides tried (H_2SO_4, ferrous sulphate, sodium arsenite), and effectively destroyed 1- to 2-year-old suckers. Autumn treatments with chlorates at a rate of 10 g./sq. m. did no harm to the soil and increased soil nitrification and ammonification in the succeeding year.

For older sucker growth it is necessary to plough and remove suckers and roots so far as possible, followed later by spraying any new growth with chlorate. Addition of H_2SO_4 (1 teaspoon to 15 litres) and soap or glue (1 g./l.) improves the efficacy of the spray. For light and medium soils, respectively, autumn sprays should be applied at rates of not more than 15 and 10 g./sq. m., and where spraying is repeated the season's total should not exceed 20–30 g./sq. m.

[2228]. 44.1 : 12.26–8 : 41 : 24.31. RENNERFELT, E. Försök att med kemiska medel förhindra stubbskottsbildning hos björk på hyggen. **[Experiments with chemical agents to prevent coppicing of Birch on felled areas.]** *Norrlands SkogsvFörb. Tidskr.* 1948 (1), (119–39). 4 refs. [Sw.sw.] (*Medd. Skogsforskn Inst. Stockh.—Ser. Uppsatser* No. 7).

(1) In preliminary trials of various chemicals in 1944, Na_2HAsO_3 proved the most effective. Experiments were continued in 1946 to study its effect when applied in each of the months May–October, in axe-cuts (1 or 2 per tree) about 20 cm. above ground level, at rates of 40 g./tree for trees over and 20 g./tree for those under 10 cm. d.b.h. The trees treated in May–August were felled in March, 1947. By August, 1947, only a few stumps had coppiced, the best kill (93%) being given by the June treatment. Controls coppiced vigorously. In a simultaneous trial on another site where coppicing was known to be exceptionally vigorous, arsenite treatment at rates up to 40 g./tree was not sufficiently effective.

(2) In a small-scale trial in summer, 1946, 'agroxon' (10% 2-methyl-4-chlorophenoxy-acetic acid) was applied in axe-cuts at a rate of 30 c.c./tree. The trees were felled in April, 1947.' By August, 1947, stumps of trees up to 12 cm. d.b.h. had not coppiced, but the dosage had been insufficient for larger trees. The same chemical was also sprayed in 1–4% solutions on to young growth of Birch 1–2 m. tall. Severe leaf injuries resulted, and after cutting back in April, 1947, over 50% of the stumps on the area that received 4% 'agroxon' were unable to coppice during the summer. It is believed that the effect would have been greater if the Birch had not been cut back, a treatment likely to stimulate coppicing. The best time for spraying appeared to be June–July. Further experiments are in progress. It is emphasized that 'agroxon' damaged the leaves of a number of species, e.g. Aspen, Alder and Willows. Needles of Scots Pine and Norway Spruce were also injured, and a laboratory test showed that germination of these species was adversely affected by 'agroxon' in concentrations down to 0·05%. Caution is therefore necessary in the use of this and similar substances in places where conifer regeneration exists.

[2229]. 44.1 : 41 : 24.31. ELWELL, H. M. **Preliminary report of chemicals for brush control.** *Oklahoma Crops and Soils 1948*, 1948 (41–4). 4 refs.

Tests were made of aqueous spray solutions containing 2,000 p.p.m. of 2,4-D. The highest % of plants affected occurred on brush 4–7 ft. high. The 2,4-D spray did not seem to be effective on the larger trees. One application of spray produced 80–95% defoliation of *Rhus glabra*, *Prunus angustifolia*, *Robinia pseudo-acacia*, *Gleditsia triacanthos*, *Diospyros virginiana*, and *Sassafras varifolium*; 50–75% defoliation of *Quercus marilandica*, *Q. stellata*, *Q. muehlenbergii*, and *Salix nigra*; it had no effect on *Ulmus* spp., *Prosopis* spp., *Celtis* spp., *Hicoria buckleyi*, *Maclura pomifera*, and *Juniperus virginiana*. In general, the 2,4-D appears to cause a gradual dying of the trees and brush. The leaves turn brown, and often the twigs curl and twist in 2–3 weeks. The plants most readily affected soon developed an abnormal knotty growth of the cambium layer along the main stems, which often caused cracking, splitting, and deterioration of the wood. The spray was not toxic to native grasses but killed broadleaved plants such as cotton and legumes. It is light and drifts readily.

Trees, brush and other plants sprayed with ammate (1 lb. per gal. of water) began to turn brown within 24–48 hours. All the species mentioned above were affected. Terminal twigs were often killed by one application, but a 2nd or 3rd application was sometimes necessary to completely kill regrowth. Ammate spray appears to be heavy, and drifting of the mist can be controlled. For this reason it can be used advantageously for controlling underbrush, weeds, etc. in orchards, gardens, etc.

Experiments were also made in poison-girdling near ground level with various preparations of 2,4-D, ammate, and sodium arsenite. In general, poor results were obtained with the 2,4-D preparations. Ammate was effective on small trees. Sodium arsenite was the only chemical which killed large trees. None of them was effective when applied in holes punched in trees. The best time for girdling and poisoning seems to be during a summer dormant period, or about 2–3 weeks before leaves fall.

[2230]. 44.1 : 41 : 42.5 : 12.26–8. **An interesting case of 2,4-D injury.** *Trees, Cleveland (Ohio)* 8 (5), 1948 (14).

The fairways of a large golf course were sprayed with the ester form of 2,4-D in July, 1947, for the purpose of weed control. A power sprayer with boom attachment was used and reasonable care was taken to avoid drift. Only minor injury was noted on the leaves of lower branches of trees and shrubs on and bordering the course, that summer, but in the following spring almost every Elm showed injury: small Elms 15–20 ft. high were damaged throughout the crown, and large Elms showed injury up to about 30 ft. Many of the small trees were so near dead that they were removed in early summer. The Oaks were mostly large trees and showed injury only on the lower half. Slight injury was evident on a few Sycamores and Locusts; the Maples, Ash, Hickory and Lime appeared perfectly normal. The writer, who examined the trees thoroughly, is inclined to attribute the damage not to drift (for the material was applied with a boom close to the ground), nor to soaking into the ground (for some of the injured trees were separated from the fairway by a ditch), but, since 2,4-D is

volatile, to the vapour. This is evidently not strong enough to do much harm to mature foliage, but buds absorbed enough to affect their development. [Cf. *For. Abstr.* 10 (Nos. 688, 1611).]

[2231]. 44.1 : 41. EGLER, F. E. **2, 4-D effects in Connecticut vegetation, 1947.** *Ecology* 29 (3), 1948 (382–6).

Studies indicate that 2,4-D is a suitable herbicide for controlling most of the woody and rank weeds of fields and orchards in Connecticut. For over-all spraying of undesired species a solution of 0·5% is recommended, with brush-cutting before spraying for all shrubs and plants over 2 ft. in height. The best season for spraying in this region is from mid-May through June. For species very susceptible to 2,4-D (e.g. Willows, Alders, Birches and Sumac), spraying can be light and perhaps restricted to one side of the plant. After June, the rank weeds have produced so much growth that far more spray is needed, and the foliage is more resistant. Care must be taken to deal with the increased growth of resistant species (e.g. Blackberries and Ash) when competition of non-resistant species is removed.

[2232]. 44.1 : 23.26 : 12.25. [COSSITT, F. M.] **Mineral spirits weed conifer seedbeds.** *Amer. Nurserym.* 88 (7), 1948 (14, 57).

Further experiments have been made with dry-cleaning fluid as a weedkiller in U.S. southern nurseries [cf. *For. Abstr.* 9 (No. 2538)]. Very weedy beds with weeds overtopping 2-in. seedlings require upwards of 120 gal./acre; smaller weeds, about the size of the seedlings, were eliminated by one application at the rate of 40 gal./acre. The use of a large spray outfit, capable of pressures of 200 lb. and covering 18 ft. at one time, and having nozzles that produce a flat fan-shaped pattern, is considered best. Under certain conditions, not fully understood, some damage has been done to the foliage of seedlings. Apparently a correlation exists between the age of the seedlings, soil moisture, temperature, and the amount of spray. Seedlings less than a month old were sprayed in early May without any apparent damage; selected beds of the same seedlings sprayed in June with the temperature about 93° F. showed a 30% loss; sprayings later in the same day at slightly lower temperatures caused no loss. On the other hand, heavy sprayings of 150 gal./acre on seedlings 4–7 months old, with the thermometer at 102° F., caused no serious damage or loss. Trials were made on *Pinus palustris*, *P. caribaea*, *P. taeda*, *P. echinata* and *Juniperus virginiana*. All hardwoods sprayed were killed or seriously injured. Studies are now in progress to determine the effect of spraying on the survival of treated seedlings when planted out in forest areas.

[2233]. 44.1 : 12.26–8 : 12.11.21 : 47 (698.2). CALLAN, E. McC. **Effect of defoliation on reproduction of *Cordia macrostachya*.** *Bull. ent. Res.* 39 (2), 1948 (213–5). 2 refs. [Imperial College of Tropical Agriculture, Trinidad, B.W.I.]

Cordia macrostachya, a native of tropical America, has spread so rapidly in the island of Mauritius since its introduction in about 1890 as to become a dangerous weed. Experiments in Trinidad show that hand stripping of the larger leaves at weekly intervals from October to December significantly reduces the reproductive capacity of the plant. [Cf. *For. Abstr.* 10 (No. 2283).]

44.2. *Parasitic Higher Plants*

[2234]. 44.2 : 12.26–8 (44). Les dommages causés par le gui. **[Mistletoe damage.]** *Action for. pisc.* No. 136, 1948 (2). [F.]

Biology, distribution in France, hosts, injuries, and control, of *Viscum album*.

44.3. *Fungi*

See also *For. Abstr.* 10 (Nos. 1533, 1576, 1905–7, 1914, 2295).

[2235]. 44.3 : 12.25. POMERLEAU, R. Les caries du sapin. **[The rots of Fir.]** *For. québec.* 13 (7), 1948 (537–46). [F.]

A general account, with illustrations, of the various rots which attack *Abies balsamea*. The best timber yield is obtained by preventing the formation of large branches by young trees, releasing the crop trees at a later date, removing fallen or badly injured trees, and above all by exploiting this species at not more than 80 years of age, after which it is almost invariably subject to decay.

[2236]. 44.3 : 12.25 : 12.21 (492). VLOTEN, H. VAN *Phomopsis pseudotsugae* op Japanse lariks. **[*Phomopsis pseudotsugae* on Japanese Larch.]** *Ned. Boschb.-Tijdschr.* 20 (3),

1948 (67–71). 8 refs. [Du.] [Bosbouwproefstation T.N.O., Wageningen.]

A review of literature [cf. *For. Abstr.* 8 (No. 2093); 9 (No. 538)], together with a request for material to elucidate the distribution of the disease in the Netherlands. Canker due to this fungus has recently been reported in N. Brabant, and both canker and die-back in the Veluwe.

[2237]. 44.3 : 12.25 : 12.21 (493). BOUDRU, M. Contribution à la biologie de *Crumenula abietina* Lag. **[On the biology of *Crumenula abietina*.]** *Trav. Sta. Rech. Groenendael, Sér. C*, No. 7, 1944 [?1948]. pp. 42. 14 refs. [F.f.flem.] *Repr.* from *Parasitica* 3 (1), 1947 (1–37).

A general account of the species together with a discussion of its relation to *Brunchorstia destruens* and its connexion with die-back of Corsican Pine in Belgium. [See *For. Abstr.* 9 (Nos. 2117, 2518).]

[2238]. 44.3 : 12.25 : 12.21 (471). KUJALA, V. Murrayn mäntyä uhkaavista tuhosienistä. **[Fungus diseases of Murray Pine.]** *Metsät. Aikak.* 1948 (3), (42–4). [Fi.]

While Murray Pine is one of the most successful conifers introduced into Finland, its resistance to recent severe winters has not been matched by its resistance to fungus attack. Already before the last war, in a Murray Pine [*Pinus contorta* var. *latifolia*] stand near Punkaharju in the Lake Saimaa region, a number of trees were found dying. An investigation revealed prolific resin flow at the base of the trees, and tiny white brackets, like buttons, lower down, under the moss cover, which turned out to be fructifications of the common *Fomes annosus*. The author points out that this type of attack, occurring at the surface of the host stems and killing them rapidly, is unusual in Finland, where the fungus ordinarily occurs as a heart rot, acting very slowly. He mentions that this same type of damage has been observed in more southern countries, in Pine stands that have been raised on agricultural land, and remarks that the Punkaharju stand is of similar origin. The damage here and in another Murray Pine stand farther south, near Ruotsinkylä, is so far limited to a few acres.

The author states that micro-fungi have often proved to be more destructive than the larger polypores, and that they seem to be the worst pests of Murray Pine. Among these he mentions a micro-fungus with pycnidia about 0·5 mm. in diameter, which has done much damage in the conifer plantations of the Lake Saimaa region in general and in the Murray Pine plantations in particular. Its attacks affect crown growth and halt the height growth. Identification of the causal fungus has been difficult: it certainly belongs to the genus *Sclerophoma* and probably to the species *pityophila* (Corda) v. Hohn, which in Finland is an exceedingly common saprophyte on the bark, leaves and cones of conifers, but may occasionally become an injurious parasite, as in Russia and in England. In Scandinavia, however, it has been regarded as a harmless saprophyte. The worst damage by this fungus (which seems to be known also as *Dothichiza ferruginosa* Sacc.) was not in the Lake Saimaa region, but farther west, at Urjala, near Lake Nuutajärvi, where Murray Pine plantations some 25 years old had been hit so badly that in many places large areas have had to be clear-felled. As the site was of the good *Oxalis-Myrtillus* type and the trees were doing well, the economic loss has been considerable.

An examination of the dying trees in the Nuutajärvi stands revealed that here the Murray Pine is being attacked by at least 3 fungi, viz. *Crumenula abietina*, with its pycnidial (conidial) form *Brunchorstia pinea*, *Crumenula sororia*, and *Dasyscypha subtilissima*, the 2 latter also in association with their pycnidial forms. In the Nuutajärvi district, *Crumenula abietina* is causing die-back of Murray Pine, killing the terminal buds on branches and spreading thence downwards, along the bark and the pith. Often the stem and the thicker parts of the branches are healthy, while the tops with their needles have suffered complete destruction. Identification is easy, as fructifications—both apothecia and *Brunchorstia* pycnidia—occur in plenty on the surface of branches and needles.

Profuse flow of resin was another conspicuous phenomenon in the Nuutajärvi Murray Pine stands. Many trunks were covered all over with white resin, others were just beginning to flow. When the starting points of the flows were examined, fructifications of *Crumenula sororia* and *Dasyscypha subtilissima* were found. *Crumenula sororia*, which has been confused with other fungi or ignored, occurs fairly commonly on the living

branches of Scots Pine, causing minor scars and bluing. In the Nuutajärvi stands, it invades the Pine trunks, killing the bark and cambium in strips and finally destroying the trees completely. No records of such severe damage by this fungus have been published elsewhere; on the contrary, it has been regarded, if it has been recognized at all, as a pathogen of minor significance.

In the same stands, similar damage to the bark of trunks is being caused by *Dasyscypha subtilissima*. In Finland it is not an obligate parasite, being common on dead branches of Pine trees and on slash. In the Nuutajärvi stands it causes much the same damage as *Crumenula sororia*, which often occurs together with it. The author also inspected stands in the Ruotsinkylä experimental area, where some resin flow was in evidence and found that here, too, the principal cause was *Crumenula sororia*, which was also identified on sporadic resin flows in Murray Pine stands in the Punkaharju district. The author thinks that the Nuutajärvi experimental stands, which have not been thinned and in which dead branches have become abundant, offer just the right conditions for these conditional parasites, although micro-climate may also play its part on wetter sites.

[2239]. 44.3 : 12.25 : 12.21 (410). **[*Fomes annosus* infection of Pine in East Anglia.]** *Rep. For. Comm., Lond. 1947*, 1948 (39).

Investigations are in progress on the death of groups of 20- to 25-year-old Pine in East Anglia, associated with the root fungus *Fomes annosus*. A large-scale survey indicates that infection is mainly through root contact, that the stumps of trees removed in early cleanings are a serious source of infection, and that the disease tends to be worse on alkaline soils.

[2240]. 44.3 : 12.25 : 12.21 (485). RENNERFELT, E. Om förekomsten av blåsroststadiet i *Peridermium*-angripna tallbestånd. **[The occurrence of the blister-rust stage in Scots Pine stands attacked by *Peridermium*.]** *Norrlands SkogsvFörb. Tidskr.* 1947 (2), (191–215). 7 refs. [Sw.sw.] (*Medd. SkogsforsknInst. Stockh. Ser. Uppsatser* No. 6.)

Cf. *For. Abstr.* 8 (No. 682). The present paper is concerned especially with the distribution of the fungus in the trees and correlations of visible stem lesions with aecia, as shown in a study in spring 1946 of two plots, one in S. and the other in N. Sweden, all trees of which were felled and examined branch by branch. On the S. Swedish plot 11 trees with well developed stem lesions showed a total of 54 aecia, some on the twigs and some on larger branches. Of the remaining 70 trees (without stem lesions), 68 were free from aecia while the 2 exceptions had each 1 aecium. The N. Swedish plot showed 15 trees having neither aecia nor stem lesions, and 11 trees with stem lesions and having a total of 20 aecia. Of trees felled elsewhere in Sweden 85 having no stem lesions showed only 2 aecia (0·02 per tree), whereas 59 trees with lesions had 627 aecia (10·6 per tree), and on 17 of these the stem lesions were also spore-bearing.

The situation of the stem wounds appears to influence the distribution of the aecia. Trees with wounds near the mid-point of the stem often had a dying crown and either lacked aecia or had only a few in the branches. Those with stem lesions near the top usually had a vigorous crown below the lesion and in the branches of these a large number of aecia were often found.

It is clear that attacked trees represent important foci of infection and that efforts should be made to remove them. Inoculations showed that the fungus involved was *Peridermium pini*, the aeciospores of which directly reinfect Pines. Removal of infected trees is also advisable in view of some suspicion that the trees vary genetically in resistance to this fungus.

[2241]. 44.3 : 12.25 : 12.21 : 23.6 : 23.22. BOGGESS, W. R., and STAHELIN, R. **The incidence of fusiform rust in Slash Pine plantations receiving cultural treatments.** *J. For.* 46 (9), 1948 (683–5). 4 refs.

The incidence of fusiform rust (*Cronartium fusiforme*) was studied in plantations laid out to test the effect of cultivation, fertilization and intercropping with cotton on the growth of planted Slash Pine. Cultivation resulted in a marked increase of *Cronartium* cankers [cf. *For. Abstr.* 6 (256)]. Cultivated and fertilized plantations produced 1½ times as much volume as uncultivated, but the volume of cankered trees was 4 times as great, which left about the same volume of healthy trees on all 3 plots. About 90% of cankers were on the stems.

[2242]. 44.3 : 12.25 : 12.21 (7). MARSHALL, R. P. **A white root rot which merits study as a possible cause of White Pine blight.**

Sci. Tree Topics 1 (9), 1948 (66–8). [Bartlett Tree Research Laboratories, Stamford, Conn.]

Planted Pines in the eastern United States and Canada are sometimes subject to a disorder which causes them to become more or less permanently stunted and yellowed. *Pinus strobus* is more affected than other common Pines. In the course of research into this condition, it was found that the roots of many affected trees were infested with a fungus identified as *Corticium galactinum*. Further research is in hand to establish whether this infection is primary or secondary.

[2243]. 44.3 : 12.25 : 12.21 : 45.3 : 13.2 (485). WITTE, A. Skadegörelse på Douglasgran. **[Damage to Douglas Fir.]** *Svenska SkogsvFören. Tidskr.* 46 (1), 1948 (10–8). 20 refs. [Sw.]

A reconnaissance in 1947 showed that of the 3 chief forms of *Pseudotsuga taxifolia*, f. *caesia* and f. *glauca* have practically disappeared from cultivation in Scania, while f. *viridis*, though apparently immune to *Rhabdocline pseudotsugae*, is more severely attacked by *Phaeocryptopus gäumanni* and to some extent by *Gilletteella cooleyi*. Brief accounts are given of both the fungus and the aphid, and localities affected are shown in a table (indicating the severity of attack) and a sketchmap. The existence of the attacks raises the question whether it is worth while to continue planting Douglas Fir in Sweden. To judge by the stands seen in Scania, it may be difficult to find suitable provenances, though if resistant trees are found it should be possible to form seed plantations by grafting.

[2244]. 44.3 : 12.25 : 12.21 (410). KEATINGE, G. ***Keithia thujina.*** *Quart. J. For.* 42 (4), 1948 (199–200).

In Feb. 1944 the author purchased 2,000 2-year-old plants of *Thuja plicata* and planted them out in nursery lines. They did well until autumn 1945, when *Keithia thujina* developed, and by the end of the year practically all were affected, many were totally defoliated, and some appeared to be quite dead. These last were burned, but the rest were planted out in Jan.–Feb., about 1,500 in a wood and 300 in another nursery some distance away. These included totally defoliated trees, provided that their stems were still green. Of those planted out in the woodland, about half are now (1948) doing well, and the other half died, mainly from the shock of being transplanted when in a weakly condition, and in a small degree from damage by rabbits and deer. The 300 trees set out in a nursery (with rather wide spacing) almost all recovered and after 2 years were planted out in a wood where they all did well.

[2245]. 44.3 : 12.26–8 : 12.21 (73). MARSHALL, R. P. **Maple wilt.** *Shade Tree* 21 (8), 1948. pp. 4.

A short account of *Verticillium* wilt of Sugar Maple, describing symptoms and treatment. Examples are cited of two characteristics of the disease, (1) that the host may be severely infected for some time before any external symptoms appear, and (2) that infected trees sometimes make a complete recovery without treatment.

[2246]. 44.3 : 12.26–8 : 12.21 (547). PATEL, M. K., MONIZ, L., and KULKARNI, Y. S. **A new bacterial disease of *Mangifera indica* L.** *Curr. Sci.* 17 (6), 1948 (189–90). 1 ref. A.P.B.

A bacterial disease of Mango, observed at the Agricultural College Farm, Poona, appeared to be caused by a new species of pathogen, *Pseudomonas mangiferae-indicae*. On the leaves are produced a number of small angular, water-soaked areas ranging from 1 to 4 mm. in diameter. Initially light yellow, they later turn deep brown with a clear halo around the necrotic spots. The surface of the spots is often rough and raised. Where marginally infected the leaves become deformed and cracked.

[2247]. 44.3 : 12.26–8 : 12.21 (45). GUERRA, L. DEL. Le malattie parassitarie ed i castagneti del Piemonte e della Liguria. **[Parasitic diseases and the Chestnut stands of Piedmont and Liguria.]** *Ital. for. mont.* 3 (5), 1948 (266–87). [It.]

Reviews the extent and character (coppice, coppice with standards, etc.) of the Chestnut stands in these provinces (323,000 ha., or about one-third of the area of Chestnut of the whole country), gives a sketch of their management, and then discusses in detail the nature, extent and methods of control of the various parasitic diseases to which the Chestnut is liable in this area (*Phytophthora cambivora*, *Endothia parasitica* [cf. *For. Abstr.* 10 (No. 1661)], *Nectria* sp., *Coryneum* sp., and *Diplodina castanea*).

Finally the resistance or susceptibility of Chinese and Japanese Chestnuts are discussed.

[2248]. 44.3 : 12.26–8 : 12.21 (794). WILSON, E. E. **The branch wilt of Persian Walnut trees and its cause.** *Hilgardia* 17 (12), 1947 (413–30 + 17 photos). 8 refs. C.G.B.

A disease affecting Walnut (*Juglans regia*), characterized by sudden wilting of leaves on certain branches, is described. Bark and wood of the affected branches are dead and discoloured. A dense layer of fungus spores develops between the cortex and periderm of the branch, and large areas of the periderm loosen and slough away. The wilt is found in Walnut throughout the Sacramento and San Joaquin valleys and adjacent foothill areas in California. *Castanea sativa* is also attacked, and wilting of branches of *Citrus limonia* was observed in one orchard in Tulare county. A similar disease was recorded on grapefruit and oranges in that county in 1923. Unthrifty trees are noticeably more subject to wilt than vigorous ones. Branches with bark injured by exposure to the sun are commonly attacked. Young Walnut trees, except replants in mature orchards, are less subject to branch wilt than older trees. Cultures of the pathogen were studied and it was concluded that the disease in *J. regia*, *C. sativa* and in *Citrus*, was caused by the same fungus, which has been named *Exosporina fawcetti*. *From author's summary.*

[2249]. 44.3 : 12.26–8 : 12.21 (44). RÉGNIER, R. Le chancre suintant et les différents types de peupliers. **['Running canker' and the different types of Poplar.]** *C.R. Acad. Agric. Fr.* 29, 1943 (335–40). [F.] E.M.B.

Describes observations on the 'running canker' of Poplars, made at the experimental plantation at Cuts, near Noyon. The disease attacks 2 groups, the 'Balsam' and 'Black' Poplars. It is concluded that *Populus candicans* and × *P. regenerata*, which are very susceptible, must be completely eliminated from infected regions, and the introduction of new and susceptible types, such as × *P. generosa*, must be made with great caution. It is not necessary to eliminate × *P. regenerata* from areas where the canker is absent or rare, but a careful watch for the disease must be kept, and infections must be treated with tar or other antiseptics. Healthy specimens of *P. candicans*, coming from non-infected sources, can be introduced into isolated mountain regions to which their hardiness peculiarly adapts them.

[2250]. 44.3 : 12.26–8 : 12.21. NICOLAS, G., and AGGERY. Une maladie nouvelle du micocoulier (*Celtis australis*). **[A new disease of *Celtis australis*.]** *C.R. Acad. Agric. Fr.* 31, 1945 (222–4). [F.] E.M.B.

A brief account of a localized and unidentified bacterial infection.

[2251]. 44.3 : 12.29 : 12.21 (669 : 675). KOVACHICH, W. G. **A preliminary anatomical note on vascular wilt disease of the Oil Palm (*Elaeis guineensis*).** *Ann. Bot.* 12 (47), 1948 (327–9 + plate). 4 refs. O.B.D.

An examination of the fungal hyphae observed within the vessels in specimens of vascular wilt disease of *Elaeis guineensis*, suggests that the pathogen is *Fusarium oxysporum*. The presence of gum and tyloses within the necrosed vessels is recorded. *From author's summary.*

[2252]. 44.3 : 23.26 (82). FREZZI, M. J. Contribución al estudio del 'damping-off' o enfermedad de los almacigos en la República Argentina. **[Contribution to the study of 'damping-off' or nursery disease in Argentina.]** [*Publ.*] *Inst. Sanid. veg. Argent.* (*Ser. A.*) 3 (30), 1947. pp. 40. 80 refs. [Span.]

Conifers are the most susceptible of Argentine plants to damping-off in the nursery, although many other horticultural, forest and agricultural species are liable to suffer more or less severely. The disease was investigated by the Agricultural Department of the University of La Plata, and various fungi were isolated, cultivated and studied. *Pythium ultimum* with *Rhizoctonia solani* are the most important causes of damping-off in Argentina, then, in order of importance, *Fusarium*, *Phytophthora* and *Sclerotium*. All are subterranean. Disinfection of the soil with a 2% solution of formaldehyde, the application of ZnO (20 g. per sq. ft.) when the seedlings have begun to appear, disinfection of the seed with $HgCl_2$, sowing thickly in seed boxes in ordinary soil mixed with equal parts of humus, and watering in moderation, combined to give excellent results with *Pinus pinea*, *P. nigra* var. *austriaca*, *P. halepensis*, *P. radiata*, *Cupressus macrocarpa* var. *lambertiana*, *Cupressus* sp., and *Brachychiton populneum*, damping-off not exceeding

6%. In the city of Córdoba damping-off was least likely between October and March for untreated soils and seeds; temperatures favourable to rapid germination and growth, with low atmospheric humidity, protected *P. radiata* and *P. halepensis* best.

[2253]. 44.3 : 23.26.4 : 12.25 : 12.21 : 34.6 : 33.1 : 11.47. **Disease in seedlings.** *Rep. B.C. For. Serv. 1947*, 1948 (54).

A disease attacking Douglas Fir seedlings in the Duncan forest nursery was traced to one of the damping-off fungi, *Fusarium oxysporum*. The disease was most damaging 2–3 months after germination of the seed and, unlike the usual damping-off, attacked the woody-stemmed seedlings, killing them back from the top. The fungus appeared to be most active during the hot summer months. A number of experimental control methods were tried, e.g. different seedbed rolling pressures, chemical additions to the soil surface, and cover-soil treatments. The only two which were effective were the application of hardwood sawdust to the soil surface and the cultivation of hardwood sawdust into the soil. [Cf. *For. Abstr.* 9 (No. 1885).]

44.4. *Virus Diseases*

[2254]. 44.4 : 12.25 (437) : 47. SMOLÁK, J. Virosa smrku. **[A virus disease of Spruce.]** *Lesn. Práce* 27 (4/5), 1948 (113–7 + plate). [Cz.e.] [Fytopathologický ústav ČVUT, Praha.]

Describes mosaic and chlorosis symptoms observed by the author in 1945–7 on young Norway Spruces (1–2·8 m. tall) in the forests of Železné Hory (Tarabka) and Jizerské Hory, Czechoslovakia. Chlorotic and healthy foliage could be found not only on different branches of the same tree but even on different sides of the same twig. The disease appeared to be spreading, especially in the Tarabka locality. Attacks on the affected trees by gall aphids (*Adelges* or *Sacciphantes*) were increasing, and these insects may be involved in transmission of the disease. As the symptoms cannot, in the author's view, be ascribed to soil conditions, rust (*Chrysomyxa*) or atmospheric pollution (gases), he believes that a virus is responsible.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

See also *For. Abstr.* 10 (No. 1772).

[2255]. 45.1 (74) : 45.2. PEARCE, J. **Identifying injury by wildlife to trees and shrubs in northeastern forests.** *Research Report, Fish and Wildlife Service, U.S. Department of the Interior* No. 13, 1947. pp. 29. 54 refs.

A summary of injury by mammals and birds to trees and shrubs in the north-eastern United States, showing the parts of the plant affected, nature of damage, frequency of occurrence, and characteristics for identification.

[2256]. 45.11 : 12.25 : 13.2 : 23.1. MANN, W. F. **Sheep damage to Longleaf Pine seedlings.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 52, 1947 [1].

During a recent 2-year test in S. Mississippi, sheep grazing at a rate of 100/1,300 acres, on land stocked with 2- to 48-in. Longleaf Pine seedlings at 1,442/acre, damaged 86% of all seedlings under 4 ft. high. More than half the injured seedlings were browsed 2 or more times during the test, total height growth was 25% less than on ungrazed control plots, and more than 15% of the injured seedlings appear to be permanently deformed. Mortality was 4·6% compared with 2·3% in controls. [Cf. *For. Abstr.* 10 (No. 1659).]

[2257]. 45.12 : 13.2 : 07.7. HOMMEN, H. Electrische afrastering tegen wilde konijnen. **[Electric fencing against wild rabbits.]** *Ned. Boschb.-Tijdschr.* 20 (1), 1948 (4–6). [Du.]

Briefly reports the successful use at a Dutch forest nursery of a 'Winpower' apparatus, which runs on a 6-volt dry battery and feeds the fence circuit with current interrupted 50 times a minute. A test lamp is fitted which shows at a glance whether any short-circuiting is taking place. Separate earths are provided for moist and dry soils. The apparatus is guaranteed to energize 10–15 km. of wire.

The fence used was of 4 wires, the lowest 7 cm. above ground level, and the remainder at vertical intervals of 9–10 cm., making a total height of 35 cm. The ground beneath the fence was scrupulously cleared of all weeds, etc. and was kept raked to show up any rabbit

tracks. After two nights this fence was completely effective until the drought became so severe that the surface soil acted as an insulator and the rabbits could therefore experience no shock. A cheap and effective remedy was found in the provision of an earth wire fixed parallel to and level with the lowest live wire. The earthed wire was simply nailed to the posts on the opposite side to the live wire. The apparatus worked for 4 months on the same battery with practically no sign of diminishing effectiveness. The cost of installing the electric fence (including the battery apparatus) was f. 177.70 as compared with an estimated f. 629.40 for an ordinary fence of concertina wire and wire netting.

[2258]. 45.12 : 12.25 : 13.2 (676). **[Rodent protection in Cypress plantations.]** *Rep. For. Dep. Uganda 1947*, 1948 (11).

An unidentified rodent continued to cause damage in a plantation of *Cupressus lusitanica* at Muko. More frequent cleaning, to reduce the amount of cover and render the pests more easily visible to bird predators, gave good results, but was very costly. Painting the butts with coal tar was then tried with complete success, at a cost of 38–40*s.*/acre for 4 acres.

45.3. *Insects*

See also *For. Abstr.* 10 (Nos. 1689–94, 2080, 2243, 2295).

[2259]. 45.3 : 07.7 : 12.25 : 13.2. MATHERS, W. G. **Aerial spraying.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (4), 1948 (3–4).

The experimental spraying by helicopter of more than 11,000 acres of Douglas Fir was carried out between July 1 and 24 in the Windermere Valley, British Columbia, in order to check the outbreak of *Nepytia canosaria*. An oil spray containing 1 lb. DDT/gal. was applied at a rate of 1 gal./acre, and secured almost 100% kill of larvae. The aircraft was a Bell helicopter, Model 47 B3, equipped with spray booms. The low carrying capacity of the helicopter was offset by its ability to land and take off on small fields close to the sprayed area. Reloading time averaged only about 2 minutes. Spraying was done between the hours of 4.30 a.m. and 10 a.m., the only daylight hours when wind and thermal activity were suitable. The area treated was 2,700–3,400 ft. above sea level. The number of flights was 466, with an average spray load of 24·6 gal. The aircraft was in operation 112 hours, of which 70 hours were actual flying time. An average of 100 acres was sprayed for each operational hour and 160 acres for each flying hour. The helicopter proved quite practical for an operation of this type, where the infestation was patchy and distributed over a considerable forested area interspersed with open spaces accessible to lorries and fit for helicopter reloading.

[2260]. 45.3 : 41. KURIR, A. Laboratoriumsversuche mit DDT-Präparaten. **[Laboratory experiments with DDT preparations.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (17/18), 1948 (142–4). 2 refs. [G.g.] [Institut für Forstentomologie und Forstschutz an der Hochschule für Bodenkultur, Vienna.]

In tests of the Swiss DDT preparations Gesarol and Neocid, food materials were dusted at rates corresponding to field applications of 30–50 kg./ha. and larvae or imagos of *Epicometis hirta*, *Phyllopertha horticola*, *Dermestes lardarius*, *Melasoma vigintipunctata*, *Ips acuminata*, *I. sexdentatus* and *Lymantria monacha* were allowed to feed on them. For each of these species the author records the incidence of paralysis and death, together with the temperatures prevailing during the tests.

[2261]. 45.3 : 41 : 13.15. HOFFMANN, C. H., and MERKEL, E. P. **Fluctuations in insect populations associated with aerial applications of DDT to forests.** *J. econ. Ent.* 41 (3), 1948 (464–73). 2 refs.

Since the spring of 1945 studies have been made on the effects of aerial spraying with DDT on animal communities, and, in particular, on the more abundant insect species, in forest areas. Applications ranged from 1 to 7·5 lb. of DDT per acre. Regardless of dosage, the kill of insects shortly after the spraying was tremendous. The residual toxicity of the 1-lb. dosage lasted for about a week, and of the 2-lb. dosage, about 2 weeks; the 5-lb. dosage remained severe after 6 weeks, and there was little recovery until after 3 months. Arthropods showed great variation in susceptibility according to their contact with the poison, which depended on habits, seasonal life history, etc. Exposed species were affected more than those protected by foliage, bark, burrows or leaf mould. Timing was important. Species

caught in a susceptible stage, such as caterpillars, and flying adults of many orders, were severely reduced. Hairy species, such as butterflies and bees, seemed quite resistant. After a spraying of 5 lb. of DDT per acre there was a loss of natural enemies of aphids and mites, and short outbreaks of both groups developed. The results of 1 lb./acre aerial applications of DDT to fish food organisms in both cold-water and warm-water streams are also reported. Oil solutions were more toxic to invertebrates than were suspensions of DDT, but, regardless of treatment, all streams had more invertebrates per sq. ft. a year later, than at the time of the pre-treatment sampling, though in one stream the species composition had changed. On the whole it appears that a single aeroplane application of DDT to the forest at the rate of 1 lb./acre, which is sufficient to control many forest defoliators, does not seriously affect the terrestrial arthropod fauna or most stream-inhabiting animal populations. Dosages of 5 lb. or more of DDT per acre threaten extermination of many arthropod species, but do not cause catastrophic losses. *From authors' summary.*

[2262]. 45.3 : 41 : 07.2 : 01.4 : 13.2. AVENS, A. W., CHAPMAN, P. J., and PEARCE, G. W. **Determination of 4–6 dinitro-*o*-cresol on bark surfaces and some of its applications.** *J. econ. Ent.* 41 (3), 1948 (432–5). 1 ref.

Presents a method of determining the quality of dinitro-*o*-cresol deposited on plant surfaces in spraying. The toxicant is removed with petroleum ether, converted to a highly coloured yellow Na salt, and the colour intensity is measured by means of a photo-electric colorimeter. Bark surfaces of different plants sprayed with the same spray mixture gave widely varying deposits. A discussion of the application of deposit data is presented. Wetting agents were found to influence the gross distribution of the toxicant over the bark surface, but apparently did not influence the rate of kill at parallel concentrations. *From authors' summary.*

[2263]. 45.3 : 13.15 : 13.2. KIEŁCZEWSKI, B. Rola tasików (Hyponomeutidae) jako żywicieli pasożytnych błonkówek i muchówek w lesie. **[The role of Hyponomeutidae as hosts of parasitic Hymenoptera and Diptera in the forest.]** *Roczn. Nauk rol.* 50, 1948 (150–65). 18 refs. [Pol.e.] [Zakład Zoologii i Entomologii Uniwersytetu Poznańskiego.]

Lists parasites of *Hyponomeuta* spp. and points out that these are mainly polyphagous types which also attack serious forest pests such as *Panolis flammea*, *Lymantria monacha*, *Bupalus piniarius* and *Lophyrus pini*. The *Hyponomeutae* are thus indirectly useful and might well be encouraged by providing food in the form of forest undergrowth, e.g. *Euonymus europaeus*, *Prunus spinosa*, *Crataegus* spp.

[2264]. 45.3 (437) : 12.25 : 13.2 : 42.22 : 43. KALANDRA, A. Kalamitní škůdci, sucho a požáry v lesích Čech a země Moravskoslezské v r. 1947. **[Catastrophic insect outbreaks, drought and fires in the forests of Bohemia and Silesia in 1947.]** *Lesn. Práce* 27 (2), 1948 (33–8). 6 refs. [Cz.russ.e.] [Stát. výzkumný ústav pro ochranu lesů, Praha.]

Lists forests where, largely owing to wartime shortages of labour for barking windthrown and snow-broken timber, Norway Spruce has suffered from bark-beetle attack. In some places the epidemic is declining or has been checked, elsewhere it persists. The chief species involved is *Ips typographus*, with which are associated *I. amitinus*, *Pityogenes chalcographus* and *Polygraphus polygraphus*.

Two foci of infestation by *Lymantria monacha* on Norway Spruce are reported. In neither case was the area of complete defoliation more than 1 ha. Partial defoliation of Spruce by larvae of *Asthenia pygmaeana*, accompanied by *Pachynematus montanus* and *Lygaeonematus abietum* was observed over large areas near Vsetín in the Moravian Beskid Mts. *Epiblema tedella* caused partial defoliation of Spruce over several ha. near Hořice in Bohemia.

Silver Fir, except for considerable damage by *Semasia rufimitrana* at Košice, escaped serious insect damage.

Fires, chiefly along the railways, destroyed many hundreds of ha. of promising forest.

The 1947 drought caused losses of 50% and more in the year's new plantations and did great damage in nurseries. It also caused serious losses in young Spruce, up to and even beyond the pole stage, especially in the warm interior of Bohemia, and further losses are expected in 1948. [Cf. *For. Abstr.* 10 (Nos. 2215, 2294).].

[2265]. 45.3 (436) : 11.21. SCHIMITSCHEK, E. Massenauftreten wichtiger Forstinsekten

in Österreich. **[Mass outbreaks of important forest insects in Austria.]** *Cbl. ges. Forstw.* 70 (2), 1947 (158–204). 53 refs. [G.]

Reviews, from the literature, outbreaks of many forest insect pests, chiefly during the period 1881–1944 and with special reference to their regional distribution in Austria, which is illustrated by sketch-maps. Besides forest pests proper, Anophelines are included as enemies which the forester has opportunities of controlling in part by his drainage and torrent-training operations, etc., and there is a historical note on the ravages in former centuries of *Locusta migratoria*. Some attention is also paid to possible correlations between insect outbreaks and climatic conditions.

[2266]. 45.3 : 12.25 : 13.2 (436). KURIR, A. Die Massenvermehrungsgebiete der Nonne (*Lymantria monacha* L.) in Österreich von 1888–1947. **[The mass-outbreak regions of the nun moth in Austria, 1888–1947.]** *Cbl. ges. Forstw.* 70 (3/4), 1947 (338–59). 77 refs. [G.g.] [Institut für Forstentomologie und Forstschutz der Hochschule für Bodenkultur, Vienna.]

[Cf. *For. Abstr.* 10 (Nos. 737–9).] The present paper reviews an extensive literature on the nun moth in Austria and strongly contests Schimitschek's hypothetical division of the country into 3–4 zones as regards nun-moth attack. The areas where outbreaks have occurred have a mean January temperature of – 2 to – 6° C., a mean July temperature of 13–18° and a mean annual temperature of 4–8°, with a rainfall of between 500 and 1,600 mm. The 1946–7 attack in the Salzatal, at an altitude of 650–1,200 m., was exceptional and is attributed to the weather's being favourable in these 2 years, and to a paucity or absence of parasites, larval disease and predators at these altitudes.

[2267]. 45.3 : 12.25 : 13.2 : 13.15. SCHEDL, K. E. Nonnenstudie aus Österreich. Teil I: Wanderung der Altraupen. **[A nun-moth study from Austria. Pt. I: Migration of the old larvae.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (17/18), 1948 (139–41). 5 refs. [G.]

The author's observations show that in the Austrian Alps, as elsewhere, the clustering of old nun-moth larvae near the base of trees is a common phenomenon. Where the population is not dense, this behaviour is associated chiefly with the search for a place in which to pupate: elsewhere it is a reaction to overpopulation.

[2268]. 45.3 : 13.2 : 32.25. Zur Borkenkäferbekämpfung. **[Control of bark beetles.]** *Schweiz. Z. Forstw.* 99 (4), 1948 (217). [G.F.]

Illustrates the 'FIX' support for cloths used to collect debris when logs are barked.

[2269]. 45.3 : 12.25 : 13.2 (494) : 41. ROTH, H. Zur Borkenkäferbekämpfung. **[Notes on bark-beetle control.]** *Schweiz. Z. Forstw.* 99 (5), 1948 (281–5). [G.] [Abt. Schädlingsbekämpfung, J. R. Geigy AG., Basel.]

Reviews the problem of bark-beetle control with chief reference to insecticides, especially Gesarol (DDT). Aerial dusting is impracticable since effective control requires that the whole stem of the trees should be dusted. As trees are often attacked at 20–30 m. above ground level, and as the beetles appear to prefer the lee side of the stems, motor dusting from the ground is extremely difficult and effective treatment likely to be very costly; where money is no object, however, this method can be used with success, and it might possibly pay in the case of small, sharply defined foci of infestation in the forest. Treatment of the soil with Gesarol, as a dust or in solution, fails to account for the many beetles that may overwinter in the tree stems. Trials of trap logs treated with Gesarol are in progress, but no results are yet available. At present, the main sphere of use for Gesarol is for dusting the sheets used to catch the debris when infested logs are barked [cf. *For. Abstr.* 9 (No. 580)] and the heaps of bark awaiting burning, i.e. as a means of preventing the escape of beetles during these phases.

Of other chemicals tried in bark-beetle control, calcium arsenate has never proved effective, and 666, though its use has as yet been insufficiently investigated, is likely to be less satisfactory than Gesarol as its effective life is shorter.

In conclusion, the author stresses that the present outbreaks in Switzerland are the result of an unusual conjunction of circumstances (weather, war-time neglect in the forests of neighbouring countries, and the existence of large conifer plantations on unsuitable sites), and that a return to normal weather for 2–3 years should see the end of these outbreaks.

[2270]. 45.3 : 12.25 : 13.2 (494). ZEHNDER, J. Praktische Erfahrungen bei der Borkenkäferbekämpfung. **[Practical experience in bark-beetle control.]** *Schweiz. Z. Forstw.* 99 (5), 1948 (285–8). 3 refs. [G.]

Brief notes on organization of the work, with particular reference to barking and practical details regarding the use of cloth sheets to catch the bark removed.

[2271]. 45.3 : 12.25 ; 13.2 (711) : 31.4. RICHMOND, H. A. **Deterioration of Hemlock looper attacked stands.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (4), 1948 (4).

Review of permanent sample plots in Vancouver is revealing the full effects of the recent outbreak of Hemlock looper. Heavily defoliated trees, which appeared to be recovering in 1947, are now dead or dying in large numbers. In Hemlock and Balsam Fir, girdling by the round-headed borer, *Tetropium* sp., is the chief agency contributing to mortality; in Douglas Fir it is the Douglas Fir bark-beetle [*Dendroctonus pseudotsugae*]. Sitka Spruce is as yet free from secondary attack, and even heavily defoliated trees appear to be recovering vigorously.

A total analysis of selectively felled trees indicates that general deterioration of trees dead for one year is high. Sap rots and the larger wood-inhabiting insects are most abundant in the upper and less merchantable parts of the trees, but the lower parts contain heavy populations of ambrosia beetles which will cause losses from degrade. The rate of decay in all species is greatly accelerated by the presence of large populations of secondary insects.

[2272]. 45.3 : 12.25 : 13.2 : 21.6 : 24.3. MCLINTOCK, T. F. **Evaluation of tree risk in the Spruce-Fir region of the Northeast.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (415–9). 5 refs.

The author expounds a system of tree classification which has been developed for the benefit of those marking budworm-infested stands of Spruce and Balsam Fir for selection cutting. The classification is based on 3 factors—crown class, crown ratio, and vigour—a tree being given from 1 to 3 points for its position in the scale of each of the variables, as follows:—

	Rating in points		
Variable	3	2	1
Crown class .	D. and co-d.	Intermediate	Overtopped
Crown ratio .	7–10	4–6	1–3
Vigour . .	I	II	III

[2273]. 45.3 : 12.25 : 13.2 : 21.8. BLAIS, J. R., and THORSTEINSON, A. J. **The Spruce budworm in relation to flowering conditions of the host tree.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 4 (5), 1948 (1).

Field studies of budworm populations on flowering and non-flowering Balsam Fir trees have led to the following conclusions: Budworm larvae feeding on Balsam staminate flowers have an advantage of 4–5 days in their rate of development over larvae that feed on Balsam Fir foliage in the early part of the season [cf. *For. Abstr.* 10 (No. 741)]. The density of budworm eggs in relation to the number of developing Balsam buds is essentially the same on flowering and non-flowering trees, indicating that the female moths do not make a definite selection between the two types of tree at the time of oviposition. But it has been found that the flower scars are very important as hibernating niches for the young larvae; the flower buds are also favoured by newly emerged larvae instead of mining the needles until the vegetative buds open, which is usually some 10 days after emergence of the budworm from hibernation. As a consequence, the flowering trees harbour much larger populations than the non-flowering.

Controlled laboratory and insectary rearings of budworm larvae on Balsam Fir foliage with and without staminate flowers and on White Spruce foliage have confirmed, in general, results obtained in 1947. Survival was essentially the same on each food type, and fecundity of the ensuing moths was not significantly different between the 3 food types. The possibility that the male flowers might have nutritional advantages over foliage has, therefore, no support from experimental data.

[2274]. 45.3 : 12.25 : 13.2 (7) : 12.11 : 12.14.5 : 12.14.7 : 11.22. WELLINGTON, W. G. **Measurements of the physical environment [of Spruce budworm].** *Bi-m. Progr.*

Rep. For. Insect Invest. Dep. Agric. Canada 4 (5), 1948 (1–2).

In connexion with more general studies of the microclimate of various forest insects, comparisons of the internal temperature of male flowers and vegetative buds of White Spruce, Jack Pine, and Balsam Fir in relation to surrounding air temperatures, have been made at the Pointe aux Pins field station near Sault Ste. Marie. Thermoelectric measurements recorded over 24-hour periods have shown that the internal temperatures of needles, vegetative buds, or flowers in direct sunlight may all be more than 10° F. above the air temperature, or, at night, slightly below the level of the air temperature. Nevertheless, while all parts of a tree exposed to sunlight are warmed by insolation, flowers apparently absorb more radiation than do vegetative buds similarly exposed. White Spruce flowers appear to be most efficient, their temperature commonly rising 10° or 15° above that of the vegetative buds. Balsam Fir has not been observed under ideal conditions, but, under thin, high cloud, its flowers still range 4° or 5° above its buds, suggesting values in full sunlight close to those noted for Spruce. Jack Pine is inferior to White Spruce in sunlight, but its flowers still range 5–10° above the bud temperatures.

These temperature differences were observed during typical cool spring weather. They are persistent under natural conditions, and their occurrence suggests that one reason why budworm populations appear to be more successful on flowering than on non-flowering trees is that, on the former type, small larvae have access to more efficient 'greenhouses' during the cool, bright, spring weather common to the interior of the North American continent. Since insect development is greatly dependent upon temperature, the effect of the much higher temperatures in the flowers would be to accelerate the development of young larvae so long as they remained in the flowers.

[2275]. 45.3 : 12.25 : 13.2 (71) : 13.15. WILKES, A., and ANDERSON, M. **Notes on recovery of the introduced Spruce budworm parasite, *Phytodietus fumiferanae* Rohw. in Eastern Canada.** *Repr.* from *Annual Report of the Entomological Society of Ontario 1946*, [1947?] (40–4). 2 refs.

Report on a small-scale investigation of the degree of parasitism of Spruce budworm effected by the release of parasites from British Columbia in infested areas of Eastern Canada [cf. *For. Abstr.* 9 (No. 1300)]. It appears that *Phytodietus fumiferanae* can withstand the normal climatic conditions in the east and may be considered as more or less established in at least one area in which it has been released in E. Ontario. So far, none of the dipterous parasites transferred from British Columbia has been recovered in the field.

[2276]. 45.3 : 12.25 : 13.2 : 13.15. DOWDEN, P. B., BUCHANAN, W. D., and CAROLIN, V. M. **Natural-control factors affecting the Spruce budworm.** *J. econ. Ent.* 41 (3), 1948 (457–64). 14 refs.

A preliminary report on studies of Spruce budworm (*Archips fumiferana*) inaugurated by the U.S. Bureau of Entomology and Plant Quarantine in 1945, when a number of study plots were established in heavily infested areas of the Adirondacks. A list of parasites has been compiled and is presented. Two species of parasite were obtained in Colorado and several colonies were obtained from British Columbia for release in the Adirondacks. Plans have been laid to collect *Compsilura concinnata* in the Eastern States for liberation in Colorado infestations. The importance of birds as predators is discussed; they are apparently more effective in light infestations. Few diseased larvae or pupae have been observed. In some years late spring frosts kill large numbers of larvae. Parasitism was high in both heavy and medium infestations in the Adirondacks and also in Colorado. Aggregate parasitism in the Adirondacks ranged from 49–81% in 11 study plots in 1946; in Colorado it ranged from 34–72% at 7 collection points in 1945. [Cf. *For. Abstr.* 9 (Nos. 576, 1298, 1301).] *From authors' summary.*

[2277]. 45.3 : 12.25 : 13.2 : 13.15. MULDREW, J., and FELL, W. **Notes on the biology of the Larch sawfly.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 4 (5), 1948 (2–3).

[2278]. 45.3 : 12.25 : 13.2 (492) : 41. FRANSEN, J. J. Aanvullend onderzoek omtrent gevoeligheid van de lariksspinselbladwesp (*Cephaleia alpina*) voor enkele bestrijdingsmiddelen. **[Supplementary experiment on the**

susceptibility of *Cephaleia alpina* to certain insecticides.] *Ned. Boschb.-Tijdschr.* 20 (1), 1948 (23–6). 6 refs. [Du.]

The supplementary tests [for previous work see *For. Abstr.* 9 (No. 567)] concerned the following:—(1) Na_2SiF_6, the effect of which is shown to be almost entirely that of a stomach poison, the previously suspected contact effect being comparatively feeble. If this insecticide is used, it should be remembered that a single shower may destroy the effects of a dusting. (2) $CaCN_2$, which proved to have a considerable contact action and could probably be used against *C. alpina* with good effect at a concentration of 12·5% in 'dolomite marl'. (3) DDT and 666 (the γ isomer), of which DDT, even at 5% concentration, was ineffective, while 666 was completely effective in concentrations down to 0·125% against the full-grown larvae.

[2279]. 45.3 : 12.25 : 13.2 (492) : 21.8. VOÛTE, A. D., and PELKWIJK, A. J. TER. Een oorzaak van het optreden van plagen der lariksmot in Nederland. [**One reason for the occurrence of outbreaks of *Coleophora laricella* in Holland.**] *Ned. Boschb.-Tijdschr.* 20 (1), 1948 (7–15). 4 refs. [Du.e.] [Instituut voor Toegepast Biologisch Onderzoek in de Natur, and Laboratorium voor Algemeene Zoölogie der Rijks-Univ. te Utrecht.]

Discusses the results of biological studies of *C. laricella* in the Netherlands, concluding that: (1) Its life history there is the same as that described for other European countries. (2) Larval mortality is materially affected by date of needle yellowing, which can determine the possibility of an outbreak; for if the needles remain green till late autumn, the larvae are not stimulated to migrate to the twigs, but attach themselves to and are shed with the needles. As needles of trees in good growth are cast later than those of poorly growing trees, larval mortality is much higher in the former. Measures against the pest should include the creation of favourable growth conditions and selection of Larch for late needle-fall.

[2280]. 45.3 : 12.25 : 13.2. LINDE, R. J. VAN DER. De beschadigingsbeelden van de dennenscheerder. [**The characteristic features of attack by *Myelophilus piniperda***]. *Ned. Boschb.-Tijdschr.* 20 (1), 1948 (16–22). [Du.]

A review designed to aid recognition of this pest by the form of attack at various stages of its life history.

[2281]. 45.3 : 12.25 : 13.2 : 07.7. BINAGHI, G. Nuovi mezzi di lotta contro la processionaria dei pini (*Thaumatopoea pityocampa* Schiff. Lep. Thaum.). [**New methods for the control of the Pine processionary moth.**] *Repr.* from suppl. to *Memorie della Società entomologica Italiana* 26, 1947 (41–7). [It.] I.I.E.

An account of experiments in the control of the Pine processionary moth on Austrian Pine by injecting nests with (1) DDT mixed in petrol, (2) pure petrol, (3) petrol with various percentages of paradichlorobenzol. Injections of 10 c.c. of (1) produced 100% mortality. Both 5 c.c. and 10 c.c. of (2) produced lower, but still considerable mortality. Ten c.c. of a 5% solution of paradichlorobenzol produced 100% mortality, did no injury to the trees, and cost only one lira per injection or 25% less than the DDT treatment. Suggestions are made for adapting for this purpose the 'Vermorel' pump ordinarily used for sulphur-spraying of vines.

[2282]. 45.3 : 12.25 : 13.2. MASELLI, V Considerazioni tecnico-economiche su nuovi mezzi di lotta contro la processionaria dei pini (*Thaumethopoea* [sic] *pityocampa* Schiff. [**Technico-economic considerations on the new methods of combatting the Pine processionary moth (*Thaumatopoea pityocampa*).**] *Ital. for. mont.* 3 (4), 1948 (236–7). [It.]

Puts forward arguments in favour of adopting Binaghi's method of injecting a 10% petrol solution of paradichlorobenzol into the nests of the Pine processionary moth and counters the arguments of those who (1) say the damage done by this species is not great enough to justify expenditure on control, (2) think the old method of hand collection and burning of nests is adequate.

[2283]. 45.3 : 12.26–8 : 13.2 (729.88). BARBER, H. S. **A new *Schematiza* [*S. cordiae*] on *Cordia* [*macrostachya*] in Trinidad (Coleoptera: Chrysomelidae).** *J. Wash. Acad. Sci.* 37 (7), 1947 (242–3). [U.S. Bureau of Entomology and Plant Quarantine.] A.P.B.

[2284]. 45.3 : 12.26–8 : 13.2 : 23.23.1. **Insects [*Nanophyes terminaliae*] in *Terminalia paniculata* fruits.** *For. Res. India Burma 1945–6*, Pt.1, [1947?] (111).

[2285]. 45.3 : 12.26–8 : 13.2 (73). CONNELL, W. A., and BEACHER, J. H. **Life history and control of the Oak lace bug [*Corythuca arcuata*].** *Bull. Del. agric. Exp. Sta.* No. 265, 1947. pp. 28. 22 refs.

[2286]. 45.3 : 12.26–8 : 13.2 (749). HAMILTON, C. C. **The Pin Oak sawfly.** *Shade Tree* 21 (9), 1948. pp. 4.

Further information on *Caliroa lineata*, a new and rapidly increasing pest of *Quercus palustris* in New Jersey. [Cf. *For. Abstr.* 9 (No. 2588).]

[2287]. 45.3 : 12.26–8 : 13.2 (437) : 13.15. KOLUBAJIV, S. Příspěvek k poznání přírodních nepřátel obaleče dubového. **[On the natural enemies of *Tortrix viridana*.]** *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (157–76). 62 refs. [Cz.e.russ.] [Ústav pro ochranu lesů, Prague.]

Details the parasites (of which 19 are new records) and predators observed to attack *T. viridana* during the outbreak of this pest in Bohemia during 1940–4. The most frequent parasites were *Pimpla* (*Itoplectus*) *maculator* F. and *Actia* (*Gymnoparaea*) *pilipennis* Fall., while the most effective predators were the Mirids *Calocoris ochromelas* Gm., *Cyllocoris flavoquadrimaculatus* Deg., and *C. histrionius* L.

[2288]. 45.3 : 12.26–8 : 13.2 (492) : 41. FRANSEN, J. J. Bijzonderheden omtrent de eikenbladroller (*Tortrix viridana* L.) en zijn bestrijding. **[Notes on *Tortrix viridana* and its control.]** *Ned. Boschb.-Tijdschr.* 20 (6), 1948 (157–69). 26 refs. [Du.]

Reviews literature on *T. viridana* and its control. Refers to a small-scale dusting experiment of the author's [see *For. Abstr.* 9 (No. 567)] and adds some results from a laboratory dusting experiment made in 1943 to compare the individual efficacy of Na_2SiF_6, $BaSiF_6$, derris and pyrethrum at various concentrations in a medium which was probably 'dolomite marl'. The test larvae were of various ages and were hidden within the leaves which they had rolled. Derris powder (1% rotenone) or 40% Na_2SiF_6 gave kills of 100%. Neither $BaSiF_6$ (concentrations up to 40%) nor pyrethrum (up to 0·1% pyrethrin) gave a complete kill. Sufficient effect in the field would be represented by the cessation of feeding a few days after treatment: by this standard, 10% Na_2SiF_6, 40% $BaSiF_6$ or derris powder of ¼% rotenone content would suffice for control. Field tests should be undertaken with these and with the new insecticides, e.g. DDT and 666.

[2289]. 45.3 : 12.26–8 : 13.2 (478 : 479). ANFINNIKOV, M. A. Povrezhdaemost' razlichnykh drevesnykh porod drevesnitsey v-edlivoy. **[Susceptibility of various tree species to attack by *Zeuzera pyrina*.]** *Priroda, Moskva* 37 (7), 1948 (58–60). 9 refs. [Russ.] A.C.P.

In Stalingrad Province and the N. Caucasus, Ash appears to be a favourable food for *Zeuzera pyrina*, both male and female pupae being considerably larger and heavier on Ash than on Oak. Size of pupae has been shown to be directly correlated with fertility in other moths and it may therefore be presumed that a greater fertility of *Z. pyrina*, when raised on Ash, may explain the fact that many tree species are attacked only in mixture with this species. In the absence of Ash, *Z. pyrina* was also absent. Pure Ash stands must often constitute foci of infestation. Species rarely attacked by this pest, whether in pure or mixed stands, include Oak, *Gleditsia* and species of Maple, and such species should be substituted for Ash, especially in southern regions and on dry aspects where conditions particularly favour *Z. pyrina*.

[2290]. 45.3 : 12.26–8 : 23.23.1 : 13.2 (437). ČERMAK, K. Škůdci jilmového semene: předběžné stručné sdělení. **[Pests of Elm 'seed': a brief preliminary report.]** *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (177–80). 2 refs. [Cz.e.russ.] [Ústav pro ochranu lesů, Prague.]

Three types of injury to Elm [*Ulmus* spp.] 'seed' are recognized: (1) Injury caused by the sucking of nymphs of *Psylla ulmi* L. over the whole surface of the samara. (2) Partial eating of the wing, without damage to the nutlet, by caterpillars of various lepidoptera. (3) Attack concentrated on the nutlet. This, the most frequent and injurious type of damage, is caused by the caterpillars of *Orthosia circellaris* Hufn., which are reported in literature to feed in spring on Willow catkins and later on herbaceous species, but have apparently not been recorded on Elm.

[2291]. 45.3 : 12.26–8 : 13.2 (772) : 41. DEAY, H. O., and ULMAN, P. T. **DDT as a summer spray against European Elm scale.** *J. econ. Ent.* 41 (3), 1948 (506).

A report on the effects of DDT on European Elm scale (*Gossyparia spuria*) in Indiana, applied as (1) a 50% wettable powder at strengths of 0·5, 1, 2, 3 and 4% of actual DDT, and (2) a 25% emulsifiable oil at strengths of 0·5 and 2% of actual DDT. Trees were sprayed in dry weather in July, the spray being applied at 175 lb. pressure, using about 0·9 gal. per tree. All treatments except (1) at 0·5% had killed over 90% of scales 10 days after application, and every treatment had killed over 97% of scales 19 days after application. Slight or moderate burning of leaves was caused by (1) at 2, 3 and 4%. Severe burning was caused by (2) at 2%. It is concluded that a spray containing 0·5% of actual DDT applied in July will control the European Elm scale.

[2292]. 45.3 : 13.2 : 41. MORGAN, C. V. G. **Influence of oil on toxicity of benzene hexachloride.** *Canad. Ent.* 79 (6), 1947 (109). [Dominion Entomological Laboratory, Summerland, B.C.] O.R.S.

The addition of either distillate oil (42 S.S.U. Vis. 100° F., 77% U.R.) or summer oil (60–64 S.S.U. Vis. 100° F., 78% U.R.) increased to a marked degree the efficacy of benzene hexachloride when used against aphids infesting fruit trees.

46. DAMAGE BY MAN

[2293]. 46 (675). SCHMITZ, A. Quelques dégradations forestières provoquées par l'indigène du Haut-Katanga. **[Certain types of forest damage initiated by the natives of the upper Katanga.]** *C. R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (888–900). [F.]

Discusses native methods of preparing land for cultivation by cutting down all the trees over a considerable area and burning them on the comparatively small part to be cultivated (*écobuage*); the custom of felling trees at man height, leaving a stump too high to produce proper coppice growth; removal of bark for various purposes; and the construction of game traps, which involves the felling of enormous numbers of trees.

47. INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

See also *For. Abstr.* 10 (Nos. 1706–10, 1748, 2242, 2254).

[2294]. 47 (437). KALANDRA, A. Důležitější a pozoruhodnější poškození, choroby a škůdci lesních dřevin v Čechách a na Moravě v letech 1944–1945. **[The more important or remarkable injuries, diseases and insect pests of forest trees in Bohemia and Moravia, 1944–5.]** *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (148–56). [Cz.e.russ.] [Ústav pro ochranu lesů, Prague.]

Cf. *For. Abstr.* 10 (Nos. 2215, 2264, 2287).

[2295]. 47 : 12.25 (471) : 42.1 : 44.3 : 45.3. KANGAS, E. Kuusikoiden kuivumisesta metsätuho- ja metsänhoidollisena kysymyksenä. **[On the dying off of Norway Spruce woods as a problem in forest pathology and silviculture.]** *Acta for. fenn.* 52 (5), (1946) 1947 (1–192). 71 refs. [Fi.g.]

During the 1930's there were many cases of dying off, sometimes on a fairly extensive scale, in the Norway Spruce woods of S. Finland. The present paper, based on investigations of 1934–44, deals in detail with the phenomenon and its complex causes, among which wind damage and attacks by *Tetropium* spp., *Pissodes harcyniae*, *Dendroctonus micans*, *Polygraphus* spp., *Pityogenes chalcographus*, *Pityophthorus micrographus*, *Ips typographus*, *I. duplicatus*, *Dasyscypha resinosa*, *Armillaria mellea* and *Fomes annosus* appear to be primary, and proceeds to consider the problem from the point of view of silviculture. Preliminary chapters deal with methods of study and the regions concerned. There follows an extensive discussion of various common forms taken by the process of dying off (under the headings—*Dendroctonus* group; *Fomes annosus*/*Armillaria mellea* group; *Pissodes harcyniae* group; bark-beetle group; special cases), and notes on the cause of the trouble in various localities. Causes are then considered in detail, separate sections being devoted to the initiation and progress of attacks on the individual tree and on the stand, and to silvicultural operations as causes.

From the point of view of silviculture it is important that tending operations should not cause sudden changes in condition of the stand, e.g. through undue admission of light and wind.

Susceptibility to disturbances in growth as a result of tending operations varies with age, density, composition, site, previous treatment, etc., and such factors should be duly considered in tending, as well as the elimination of breeding places (bark, stumps, etc.) for insect pests. Similar principles apply to the treatment of stands already affected. Here it is also important to salvage affected trees before there is serious timber degrade. On the whole, the attacks tend to assume either a gradual, mild, chronic form, or a severe, rapid, acute one. The latter often lead to mass mortality, and extremely quick action (sanitation and salvage fellings) is called for in such cases.

[2296]. 47 : 12.25 (761). BOGGESS, W. R., and NEWMAN, R. R. **Occurrence of little leaf disease of Pine and its effects on forestry in Alabama.** *Circ. Ala. agric. Exp. Sta.* No. 94, 1947. pp. 11.

Cf. *For. Abstr.* 10 (No. 1576).

[2297]. 47 : 12.25 (758). PATTERSON, A. E., and JACKSON, L. W. R. **Extension of the range of the little-leaf disease of Shortleaf Pine in Georgia.** *Plant Dis. Reptr.* 32 (5), 1948 (191–2 + map). A.P.B.

[2298]. 47 : 12.25 : 13.2 : 45.4. JACKSON, L. W. R. **Deterioration of Shortleaf Pine roots caused by a parasitic nematode.** *Plant Dis. Reptr.* 32 (5), 1948 (192). [George Foster Peabody School of Forestry, Athens, Ga.] A.P.B.

Criconemoides rusticum was found associated with the deterioration of the fine roots, including mycorrhizae, of 1-year-old potted *Pinus echinata* seedlings, in soils from 3-year-old field stands of Pine heavily attacked by little-leaf disease. Results of the study indicate that foliar decline of Pines in the southern Pine region may be due primarily to root-invading nematodes.

[2299]. 47 : 12.25 : 34.25. ROE, A. L. **What caused 'blight' on Christmas trees in the northern Rockies in 1947?** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 65, 1948. pp. 5.

Extensive damage to the needles of Douglas Fir in the northern Rocky Mountains during 1947 seriously affected the Christmas-tree industry. It appears to have been caused by a combination of several factors, including a needle disease, insects and a spider mite, and premature cutting. Prevention of damage by the needle disease, insects and spider mite is not economically practicable under forest conditions. *From author's summary.*

[2300]. 47 : 12.26–8 (714). MARTINEAU, R. Observations sur l'état de santé du bouleau et du merisier dans le Québec. [**Observations on the condition of health of White and Yellow Birch in Quebec.**] *For. québec.* 13 (5; 6), 1948 (378–81, 383–6; 441–4, 447–9, 451–3, 455–8). [F.f.]

The data presented, mainly the result of recent field work, are analysed statistically and show that the die-back of *Betula papyrifera* and *B. lutea* in Quebec is most severe in the east of the province, gradually diminishing towards the west, and that there is a correlation between the amount of die-back and the density of stands, their age, and the diameter of the trees. It is recommended that, until the actual causes of the disease are understood, the following measures should be taken to ameliorate existing conditions:—(1) dead and dying trees should be removed as soon as possible; (2) when this has been done, heavy thinning should be avoided and only those trees removed which show signs of advanced die-back; (3) mature stands should be exploited, even if apparently healthy; (4) in normal stands, both species of Birch should be harvested rather before maturity.

[2301]. 47 : 12.26–8 (716). HAWBOLDT, L. S., and SKOLKO, A. J. **Investigation of Yellow Birch die-back in Nova Scotia in 1947.** *J. For.* 46 (9), 1948 (659–71). 14 refs.

Annual examination of sample areas in Pictou County, Nova Scotia, since 1944, when the first symptoms of die-back of Yellow Birch became apparent, shows a steady increase in the incidence of the disease. The severity of the damage is greatest adjacent to cut-over areas, decreasing gradually as one proceeds further into the undisturbed stand. Analyses of Yellow Birch trees in an undisturbed stand and with unmistakable and sometimes advanced symptoms of die-back disclosed little, and certainly insufficient, attack by the bronze Birch borer to account for the damage present in the crown. Examination of excavated root systems of a number of trees in the undisturbed stand showed no injury to the larger root branches but there was a slightly higher rootlet

mortality with increasing crown injury. However, trees without evident die-back symptoms in the crown had from 30 to 40% rootlet mortality. Whether this may be considered a normal condition in Yellow Birch, or whether it actually represents an early stage of die-back, remains to be determined. Studies by others would indicate that healthy Birch trees do not have such a high mortality in the feeding roots. Increment studies indicate a general decline in the growth rate of Yellow Birch since 1925 with a more rapid decline since 1937 in Nova Scotia. Other species show a similar decline until 1944. Since then there has been a recovery in increment in species other than Birch. Precipitation records suggest that subnormal rainfall over an extended period has possibly contributed to the present weakened condition of Yellow Birch. *Authors' summary.* [Cf. *For. Abstr.* 9 (No. 1325).]

[2302]. 47 : 12.26–8 (54). SREENIVASAYA, M. **The spike disease of Sandal.** *Curr. Sci.* 17 (5), 1948 (141–5). [Indian Institute of Science, Bangalore.] A.P.B.

Among host plants through which Sandal [*Santalum album*] acquires relative immunity to spike disease are *Cassia siamea, Casuarina, Melia indica, Murraya koenigii, Dodonea viscosa, Semecarpus anacardium, Ficus bengalensis, Sarcostemma brevistigma* and *Ruta graveolens.* Host plants that render Sandal particularly susceptible to the disease are *Acacia, Pongamia glabra, Lantana camara, Cajanus indicus,* Divi-divi and *Ocimum sanctum.* At Javalgiri an area has been stocked with resistant types of *S. album* obtained through experiments involving transmission of the disease through grafts. [Cf. *For. Abstr.* 1 (140); 2 (287).] A shallow root system in the host, over-parasitism, weakening of the host through coppicing and the 'shading' of Sandal plants, all tend to encourage infection. Ringing can prevent the spread of the disease from one part of the plant to another, and the elimination of *Lantana* has a marked influence in reducing the incidence of the disease. Symptoms can be forced out in plants which 'mask' them, by means of pollarding. A shift in the season of greatest incidence of infection can be caused by forest fires or browsing herds. A practical scheme of disease control is outlined.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52.3. *Form. Taper*

[2303]. 52.3 : 12.25. BEDELL, G. H. D. **Form-class of White Pine and Jack Pine as affected by diameter, height, and age.** *Silv. Res. Note For. Serv. Can.* No. 89, 1948. pp. 8 + 2 tbls. 7 refs.

52.4. *Measurement of Volume*

See also *For. Abstr.* 10 (Nos. 1631, 2334, 2337).

[2304]. 52.4. THORNBER, W. **Tree volume determination.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 41 (B–6), 1948. pp. 2.

The author develops a formula:—

$$V = K \cdot \left(\frac{h}{d}\right)^m \cdot hd^2$$

where V = volume in cu. ft., h = height in feet, d = diameter in inches, and K and m are constants to be determined statistically for different species.

[2305]. 52.4. GROCHOWSKI, J. Uwagi o kształcie i pomiarze strzał drzew. [**Notes on the form and measurement of the stems of trees.**] *Sylwan* 92 [*n.s.* 2] (1), 1948 (22–32). 27 refs. [Pol.e.]

A critical review of Prof. Steinhaus's paper 'Sur la cubature des troncs des bois' ('*Colloquium mathematicum*', Wrocław, 1947, Vol. 1 (1), pp. 23–8) in which he claimed that by modifying Huber's formula ($V = 0{\cdot}8d^2l$ instead of $V = \frac{\pi}{4} d^2l$) the error in measuring the volume of a truncated cone can be reduced from 3·57% to less than 2%; he also maintained that by measuring the diameter not at mid-length but at 0·47723 of the length from its base, the error of the original Huber formula could be brought down to less than 0·625%; and that if the coefficient $\frac{\pi}{4}$ is replaced by

0·7818 and the diameter measured still lower, at 0·47247 of the length of the cone, the error may be reduced to 0·46%. Steinhaus further suggested that for logs, a more accurate estimate of volume could be got by adding a standard correction to the results obtained by the Huber formula. The Polish Forest Department having shown considerable interest in Steinhaus's claims, the author finds it necessary to warn against them. He points out that: (1) the shape of a tree, and consequently of a log, is known to differ from that of a truncated cone; no improvement of Huber's formula intended to reduce an error in the calculation of the volume of a truncated cone would therefore be of any use for forest mensuration; (2) a universal correction is not applicable to Huber's formula for the simple reason that the errors obtained by using this formula are not constant, but either negative or positive, depending on how the shape of a log differs from that of a truncated cone. Furthermore, as the calculation of a universally applicable correction obviously needs to take into account numerous factors affecting the form of a tree, a very large amount of data would first have to be collected; but even such a correction could not be expected to be universal as the shape of trees varies with changes in silvicultural treatment.

[2306]. 52.43 : 01.4. ROUSSEL, L. Le cubage du tronc des arbres par les procédés du calcul graphique. **[The measurement of tree trunks by graphical calculation.]** *Rev. Bois Appl.* 2 (12), 1947 (12–9). [F.] P.R.

[2307]. 52.43.2 (711) : 53. **Scaling studies.** *Rep. B.C. For. Serv. 1947*, 1948 (15).

The use of the cubic foot as a basis of measurement is being adopted in British Columbia as rapidly as conditions permit. Intensive studies on immature trees of several species indicate that the formula $V = \frac{3}{4} B_{\frac{1}{3}} H$ gives the total cubic-foot contents of the trees with a high degree of precision, where V = volume in cu. ft., $B_{\frac{1}{3}}$ = basal area at $\frac{1}{3}$ the height, and H = total height of the tree. Intensive studies have been made to determine the relation between cu. ft. scale, bd. ft. scale and mill tally. The most equitable method of scaling is to measure logs in cu. ft. and let the manufacturer apply a factor to suit his plant and manufactured product.

Analysis shows that the solid wood content of bundles of logs, assembled in cribs and converted to a cord basis, changes little with diameter of logs, but varies from 75 to 90 cu. ft. per cord depending on the length of wood forming the bundle. A standard unit of 100 cu. ft. has many advantages over the cord as a unit of measurement.

[2308]. 52. 43.2 (714) : 92. **Regulations and instructions concerning the scaling of wood cut on Crown lands.** Dep. Lds. For. Quebec 1946. pp. 56 + tbl.

[2309]. 52.43.2 : 84 : 01.4 (485). BÄCKLUND, O. Ny metod för virkesredovisning vid rundvirkesmätning. **[A new method of timber accountancy in the scaling of round timber.]** *Norrlands SkogsvFörb. Tidskr.* 1947 (4), (481–505). [Sw.]

Briefly describes the system of timber accountancy used by the Umeå Scaling Association, and considers in detail a possible reform involving the use of punched cards throughout, each log measured being represented by its individual card on to which the tally man would punch the necessary details instead of writing up a tally book. Subsequent processing of cards at the Association's headquarters would be done by Powers automatic equipment. In spite of some increase in annual costs, it is estimated that this would be fully compensated by advantages such as the following: (1) Each woodcutter's output could be separately recorded. (2) Hauliers could load timber without regard to assortments, thus using the full load capacity of their vehicles. (3) Scalers would be relieved of the trouble of writing up the primary data.

The system proposed is thought to have great promise, so far as preliminary trials and deductions go, but cannot be finally judged until it has undergone full-scale practical trials.

[2310]. 52.43.3. SCHAEFFER, L. Gammes de barèmes à double entrée pour le cubage du tronc des arbres sur pied. **[Ready-reckoner volume tables for measuring volume of standing trees.]** *Rev. Eaux For.* 87 (5), 1948 (284–91). 6 refs. [F.]

Urges the advantages of securing some kind of standard for the construction of volume

tables, and suggests the use of a coefficient of taper derived from the formula

$$r = \frac{a - b \cdot h}{100},$$

where r is the coefficient of taper, h is the height of the stem in metres, and a and b are constants. Such volume tables would be sufficiently accurate for most broadleaved stands, and for many coniferous stands with a high degree of uniformity. They would not be suitable for use in stands including trees of very different heights, such as Fir woods.

[2311]. 52.43.3 : 12.25. HORNIBROOK, E. M. **Merchantable height volume for Engelmann Spruce.** *Res. Notes Rocky Mt. For. Range Exp. Sta.* No. 3, 1948. pp. 2.

[2312]. 52.43.5 (71) : 57.4. BICKERSTAFF, A. **Requirements for permanent line-plot surveys.** *Silv. Leafl. For. Serv. Can.* No. 25, 1948. pp. 2.

The minimum requirements for lay-out and marking of permanent line-plots at present being established by the Dominion Forest Service. The use of aluminium posts and markers is recommended.

[2313]. 52.43.5 : 01.7. FINNEY, D. J. **Volume estimation of standing timber by sampling.** *Forestry* 21 (2), 1947 (179–203). 27 refs.

Discusses the value of various methods of sampling, particularly the advantages and disadvantages of random and systematic sampling. An unrestricted random sample gives both an unbiased estimate of total volume and data from which the precision of the estimate can be assessed. A stratified random sample, in which the distribution of sampling units is subject to certain restrictions, ensures that the sample will be more fairly representative of all parts of the stand and hence give greater precision. In any stratification system, blocks as homogeneous as possible should be chosen. Small blocks each contributing 2 units to the sample give greater precision than larger ones, contributing several units, and still permit a numerical assessment of precision. A system of blocks in which only one sampling unit is enumerated in each may be expected to give greater precision than that from blocks twice the size and two units per block, but this precision cannot be estimated from internal evidence.

The systematic method of sampling, in which units are spaced regularly over the stand, is based on the belief that variations in volume per unit area from one sampling unit to another often follow a systematic pattern. The method gives certain practical advantages, for example, easy location of sampling units, but the first unit must be selected at random to avoid bias. A systematic sample may give a more precise estimate than the corresponding stratified random sample, but this depends on the type of variation, and no general statistical theory can state that one method will always be the better one.

Calculations for the sampling error of a random sample are only reliable when the sample is genuinely random. Figures from systematic sampling cannot be analysed as if they belonged to randomly selected units, since the whole systematic theory is based on the assumption that variations in volume show systematic trends. No assessment of precision is possible from the internal evidence of a single systematic sample without some assumption relating to the variations in volume per unit area in neighbouring sample units. A valid assessment of precision can never be based on variance among subdivisions of sampling units, though such records may be useful in investigating the precision that might be obtained with sampling units of other sizes and shapes. *From author's summary.*

[2314]. 52.43.6. BITTERLICH, W. Die Winkelzählprobe. [**The *Winkelzählprobe* [: a simplified method of determining basal area per ha. by means of a tree-diameter/spacing ratio].**] *Allg. Forst- u. Holzwirts. Ztg.* 59 (1/2), 1948 (4–5). [G.]

Describes a simplification of the *Winkelzahl* method of determining basal area per ha. [cf. *For. Abstr.* 10 (No. 1473)]. From a single point in the interior of a stand a count is made, by species and in a complete circle, of all trees giving a *Winkelzahl* exceeding 1·41. Basal area in sq. m./ha. is then given directly for each species by halving the numbers so obtained. This procedure is based on the observation that in such a circle the sum of all measurable *Winkelzahlen* exceeding some assumed limiting value, is proportional to basal area of the stand. The smaller this limiting value, the greater the

number of stems to be counted, the larger the circle to be scanned, and the more accurate the results. Practical difficulties (visibility, etc.) prevent the use of a very low *Winkelzahl*, and the value 1·41 is here selected as best combining accuracy and convenience. The theoretical basis of the method is briefly discussed.

In practice, the count of *Winkelzahlen* exceeding 1·41 is made with the aid of a stick 1 m. long, bearing at one end a clearly marked measuring line 1·41 cm. long. This is used in the same manner as the stick described in the former article, except that its purpose is simply to distinguish between readings greater than and less than 1·41. The count must be accurate and the limiting value strictly observed. Where stems overlap in the line of vision the observer must step aside to take his reading, maintaining the same distance.

The method can be used on land having a reasonably uniform slope, but in this case the results must be divided by the cosine of the angle of slope.

The author is applying for a patent in respect of a small optical instrument to facilitate measurement and to leave the observer's hands free to operate a simple counting device.

[2315]. 52.43.6. WANNER, J. Die 'Probefläche ohne Probefläche'. **[The 'sample plot without a sample plot'.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (11/12), 1948 (97–8). [G.]

The *Winkelzahl* method [see preceding abstract] gives basal area/ha. very simply and rapidly, but mean height, and preferably form factor, must be known before volume can be calculated. The author suggests that for this purpose the method should be combined with his own 'rapid circular-sample-plot' method [see *For. Abstr.* 10 (No. 781)], in which latter it would no longer be necessary to measure out a plot, though for practical convenience the area might well be about the same as the circle covered by the limiting *Winkelzahl* values. The 'rapid circular-sample-plot' method gives the b.a. of the mean tree and this, divided into b.a./ha., gives number of stems/ha. Diameter of the mean tree is found from its b.a. and a tree of that diam. is measured with a Christen hypsometer. Volume may then be obtained as the product of number of trees and volume of mean tree (from tables); or, if greater accuracy is desired, the form factor may be found by a method described in connexion with the 'rapid circular-sample-plot' method, and volume determined as the product of b.a./ha., height and form factor of mean tree. The combined method is claimed to be accurate and to take up a minimum of time.

[2316]. 52.43.6 : 07.7 : 11.4 : 52 : 61. THONET, H. M. Der 'Waldstock', ein universelles Instrument des Betriebsforstmannes, ein wertvoller Behelf für den Forsteinrichter. **[The 'forest walking stick', a universal instrument for the executive forester and a valuable aid for the forest manager.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (17/18; 19/20), 1948 (146–8; 167). [G.]

Describes [without illustrating] a patented walking stick having: (1) An iron soil-sampling ferrule. (2) A centimeter scale useful for many purposes. (3) A scale which, if the stick is 'rolled' round the girth of a tree, gives a direct diameter reading. (4) An attachment converting the stick to a sighting instrument for the *Winkelzahl* method of determining basal area per ha. (5) A clinometer attachment giving both direct measurement of gradient and the correction for gradient required by the *Winkelzahl* method. The clinometer can also be adjusted so that the stick can be used to survey suitable lines for forest roads. (6) Arrangements enabling the stick to be used as a hypsometer.

[2317]. 52.43.6. CHASE, C. D. **Cumulative tallying brought up to date.** *Iowa St. Coll. J. Sci.* 22 (4), 1948 (333–9). 6 refs.

The purpose of this paper is to present a fairly complete statement of the use of the cumulative tally sheet, which automatically converts the stand tally into volumes per acre [cf. *For. Abstr.* 4 (195)], together with correction factors for species, adjustments for various standards of utilization, and adaptation of its use for other than $\frac{1}{5}$th-acre plots.

[2318]. 52.46. CERVERA IBÁNEZ, J. M. Errores en los conteos. **[Errors in tallying.]** *Montes, Madrid* 4 (23), 1948 (415–25). [Span.]

An investigation and discussion of errors made in tallying by diameter and tallying by height and diameter, using calipers with 1-cm. graduations, calipers with 5-cm. graduations, and a measuring tape, the heights being estimated visually.

53. SOLID CONTENTS OF STACKED MATERIALS

See also *For. Abstr.* 10 (No. 2307).

[2319]. 53 : 07.7 : 33.02. FENTON, R. H. **Wood content of stacked 4-foot round pulpwood in Connecticut. Applicable to plantation-grown Pine and to mixed hardwoods.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 17, 1948. pp. 8.

Two tables are given, one showing solid content and the other percentage of space occupied by solid wood and bark respectively, in stacked pulpwood piles of various species and mixtures. The method of calculating the volumes by estimation from photographs is described in some detail. [Cf. *For. Abstr.* 9 (No. 2603).]

[2320]. 53 : 33.02. BARÓ Y ZORRILLA, F. Alrededor del esteréo. **[Concerning the stere [: methods of measuring steres of pulpwood].]** *Montes, Madrid* 4 (21), 1948 (185–95). [Span.]

54. FACTORS CONNECTED WITH ASSORTMENT

[2321]. 54 : 33.52. BENASSI, L. Cubatura e rendimento delle traverse ferroviarie. **[Volume and yield of railway sleepers [from logs of different dimensions].]** *Ital. for. mont.* 3 (3), 1948 (184–6). [It.]

55. AGE

[2322]. 55 : 56 : 12.25 : 56.02. **Growth studies.** *Rep. B.C. For. Serv. 1947*, 1948 (17–8).

For the purpose of determining the total age of older trees when a ring count is made at a known height above the ground, an analysis was made of a number of Hemlock, Spruce and Cedar seedlings growing on cut-over areas. The resulting data are given in a table showing total height in feet at ages from 1 to 10 years for Hemlock and Spruce on both good and poor soils, and for Cedar [*Thuja plicata*] on average sites. The diameter growth of Cedar on the better sites was studied by stump analysis and the results are presented in a table. Given a 6-in. Cedar aged 40 years, it may be expected, on the average, to attain 17·5 in. at 100 years and 36·8 in. at 200 years; after the age of 300 years diameter growth is a constant, regardless of size.

[2323]. 55 : 12.25 : 57.9. NICKERSON, D. E. **Age determination in growth and yield.** *For. Chron.* 24 (3), 1948 (176–8). 5 refs.

Briefly discusses possible methods of taking into account, in the construction of yield tables, the recently established fact that the physiological age of Balsam Fir appears to be independent of true age. [See *For. Abstr.* 10 (No. 789).]

56. INCREMENT

See also *For. Abstr.* 10 (No. 2322).

[2324]. 56 : 01.4. GEVORKIANTZ, S. R., and OLSEN, L. P. **An improved increment-core method for predicting growth of forest stands.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 12, 1948. pp. 19 + 2 gphs.

The authors propose and explain a method of estimating increment, which has proved reliable and requires a minimum of field and office work and only a rudimentary knowledge of statistical method. Its application requires first, the preparation of stock tables showing volumes by tree-diameter classes, and a knowledge of the number of trees in the diameters just below merchantable size in order to estimate recruitment of merchantable trees in the given period of time. The second requirement is to obtain borings to determine diameter increment and total age of sample trees of various sizes taken at random in the area. These will be used to estimate the probable future increment in diameter for trees of each species and diameter class. The number of borings needed will depend on the accuracy desired and the number of condition classes for which growth predictions are required. Sample trees will be used also to estimate average heights corresponding to various diameters. The third step is to convert this average diameter increment into increment % in volume. This requires making allowance for height growth and for the fact that volume growth is more rapid than diameter growth. Next, these percentages must be applied to the stock tables compiled from sample plots, thus obtaining gross volume increment. Finally, net increment is obtained by making deductions for estimated mortality and cull. The various steps are explained in detail and illustrated by sample tables.

[2325]. 56.02 : 07.7. BICKERSTAFF, A. **Increment hammer.** *Silv. Leafl. For. Serv. Can.* No. 26, 1948. pp. 2.

Description (with illustration) of an instrument designed to replace the conventional increment borer for certain types of work where only current growth is required. Only a few seconds are required to extract a core $\frac{1}{2}$–$\frac{3}{4}$ in. long which will show current growth. The borer weighs only 13 ozs.; it is used like a hammer, the cutting bit being driven into the tree by the impact of the weighted head. Considerable skill is required to obtain a core along the true radius of the tree. [Cf. *For. Abstr.* 7 (No. 2099).]

[2326]. 56 : 07.2 : 01.4 : 12.14.5 : 12.25. BAKER, F. S. **A short method of determining leaf area and volume growth in Pine trees.** *Hilgardia* 18 (8), 1948 (335–56). 16 refs.

The determination of leaf area, leaf increment, and wood increment, and their interrelations, gives a valuable insight into the basic conditions of tree growth. The methods of analysis used to date have been so expensive in time and labour that investigations of this type have been discouraged. The chosen median twig method is described, as a means of determining leaf area, leaf volume, and wood increment of twigs [of conifers] at a reasonable expenditure of time and a satisfactory degree of accuracy. In this method, the needle-bearing twigs of the entire crown are removed and are segregated in the following stages:—(*a*) upper crown, mid crown, and lower crown; (*b*) age (leaf-bearing twigs are cut at each annual node and the twigs of each year are segregated); (*c*) size (the above segregates are sorted into large, medium, and small). In each final segregated class, an average twig is selected from a small group centring upon the median value of the class. It is shown that the twig so selected tends to be larger than average in linear dimensions but that, since the desideratum is the twig of mean wood volume, which varies with the square of the diameters, the errors come close to balancing and the chosen median twig is actually very nearly the twig of mean volume.

The determination of the number of leaves on the test tree (a Ponderosa Pine) by the chosen median twig method gave results that were slightly high ($1{\cdot}9 \pm 0{\cdot}1$ and $1{\cdot}3 \pm 0{\cdot}1$) when applied independently by two analysts. Leaf area may be determined with high accuracy by any one of a number of methods, once leaf numbers have been determined, since length and cross-section of needles are very uniform. The leafless branches and the bole present less complex problems in sampling, and volume increment is determinable by standard methods.

The method has been applied only to trees less than 30 ft. high and 9 in. in diameter. It is suggested that in large trees, with regularly developed crowns and whorls of branches, a single average branch may be cut at each node, instead of the whole whorl (normally 5 branches in Pines). This would reduce the labour of cutting and segregation by four-fifths, probably without any dangerous loss of accuracy.

[2327]. 56 : 21.6 : 12.26–8. HOLSOE, T. **Crown development and basal area growth of Red Oak and White Ash.** *Harv. For. Pap.* 1 (3), 1948 (28–33). 9 refs.

Instead of using linear diameter growth, it has been found that for Red Oak [*Quercus borealis* var. *maxima*] and White Ash [*Fraxinus americana*] in New England, a highly significant relationship exists between basal-area growth during the last 10 years, and various crown dimensions. Crown length, crown diameter, and crown surface all give very satisfactory results. This knowledge is used to construct charts which can be used in the field with crown diameter and d.b.h. as entries from which the last 10 years' d.b.h. growth can be found. *Author's summary.*

[2328]. 56.02 : 11.21 (51) : 11.15 : 12.25. TENG, S. C. **Tree rings and climate in Kansu.** *Bot. Bull. Acad. sinica.* 2 (3), 1948 (210–4). 11 refs.

Widths of annual rings in transverse sections of *Picea asperata* from Kilienshan and *Abies chensiensis* from Peilungkiang were measured, and curves plotted and compared with curves illustrating the frequency of sun spots throughout the life of the tree. A fairly close correlation exists between the two curves, the sun-spot maxima corresponding quite well with the occurrence of narrow tree rings, and with times of drought known to have occurred in the history of Kansu. The author points out that there is no evidence to warrant the assumption that rainfall alone is responsible for variations in tree growth.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 10 (Nos. 1704, 1819–20, 2312, 2323, 2348).

[2329]. 57 : 12.26–8 (945). FERGUSON, K. V. M. **Some statistics of timber yields from virgin stands of White Mountain Ash [*Eucalyptus regnans*].** *Aust. For.* 12 (1), 1948 (13–5).

[2330]. 57 : 12.25 (410 : 492). BEVERSLUIS, J. R. Engelse en Nederlandse opbrengstgegevens voor groveden. **[British and Netherlands yield data for Scots Pine.]** *Ned. Boschb.-Tijdschr.* 20 (7), 1948 (208–15). 2 refs. [Du.]

This comparison shows that stand volume for Scots Pine in Holland is at all ages and in all quality classes lower than that of British stands. Thus, despite the higher percentage of volume removed in thinnings, actual thinning yields are lower in the Netherlands. It is suggested that the reason for the difference may be a wider initial spacing in Britain, and that if this is so, trials might well be made in the Netherlands of either wider initial spacing, or the present close spacing with earlier thinning than that practised now.

[2331]. 57 : 22.82.1 : 12.25. PRODAN, M. Der Aufbau des Holzvorrates in Fichtenbeständen. **[The constitution of the growing stock in Norway Spruce stands.]** *SchrReihe bad. forstl. VersAnst.* No. 4, 1946. pp. 19. 11 refs. [G.f.]

Presents and discusses two sets of tables for regular stands of known mean diameters: (1) Distribution of stem number by 2-cm. diameter gradations, together with a table of standard deviations and a table for finding the numerical position of the arithmetical mean diameter and the tree of mean basal area. (2) Distribution of stem volume by diameter gradations, including tables (*a*) for ascertaining the total volume in stems below any selected 2-cm. diameter gradation; and (*b*) for finding the percentage distribution of the volume by 2-, 5- and 10-cm. diameter gradations.

[2332]. 57.9 : 12.25 (431–5 : 436). KRENN, K. Ertragstafeln für Fichte (1945) für Süddeutschland und Österreich. **[Yield tables for Norway Spruce in S. Germany and Austria.]** *SchrReihe bad. forstl. VersAnst.* No. 3. 1946. pp. 31. [G.]

[2333]. 57.9 : 52. DOMES, N. Studie über Bestandeshöhenkurven und Ertragstafel. **[A study of stand height curves and yield table.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (7/8), 1948 (52–4). 6 refs. [G.]

Examines the relationships of height (h), diameter (d) and artificial form factor (f) as derived from von Guttenberg's yield tables for Norway Spruce in Austria, finding that the form coefficient $k\ (= \frac{h}{d^2} f \cdot 0{\cdot}785)$ is almost constant, within a given site quality and tree class, between 30 and 130 years of age. From the mean values of k for the various tree classes and site qualities, are obtained the height and diameter of the mean trees of the suppressed and dominant classes. The results are illustrated in graphs giving height/diameter curves by age and tree classes for each (site) quality class recognized.

[2334]. 57.9 : 12.26–8 (431–5) : 52.43.3. SCHMITZ-LENDERS, B. Pappel-Ertragstafeln, mit einer Pappel-Massentafel im Anhang. **[Yield tables for Poplar (*Populus regenerata*), to which is appended a volume table.]** M. & H. Schaper, Hannover-Waldhaus. 1948. pp. 29. [G.] X.

Includes volume and money yield tables for single trees, forest stands (7×7 to 10×10 m. spacing) and stands on meadowland (20×20 m. spacing).

6. MANAGEMENT. WORKING PLANS. SURVEYS

See also *For. Abstr.* 10 (No. 1701).

60. GENERAL LAND MANAGEMENT

See also *For. Abstr.* 10 (Nos. 2144–7, 2370).

60.3. *Management of Different Classes of Forest*

[2335]. 60.31.2 (471). LINNAMIES, E. Eri suuruisten yksityismetsälöiden metsävaroista ja metsien tilasta. **[An investigation of the growing stock and condition of variously sized private forests [in Finland].]** *Acta for. fenn.* 52 (2), (1943) 1947 (1–62). 25 refs. [Fi.g.]

A survey in two sample districts (both

containing over 20 parishes) showed that with increasing area of the forest estate there was an increase in average volume per ha. and in number and mean volume of sawlog stems. The larger forests had been better handled and were in a better condition silviculturally than were the small ones. The possible reasons for these differences are discussed. Statistics for the two sample areas are given in graphs and many tables.

61. SURVEYING. MAPPING

See also *For. Abstr.* 10 (Nos. 1550, 2316).

[2336]. 61.32 : 02.1. SPURR, S. H. **Aerial photographs in forestry.** Ronald Press Co., New York. 1948. pp. 340. 236 refs. Price $6.00 (35*s.*).

Includes 4 sections:—(1) Aerial photographs (types of aerial photographs; films, filters and season of photography; scale and focal length, taking aerial photographs; obtaining and handling aerial photographs). (2) Aerial surveying (displacement in single photographs; overcoming displacement by radial line triangulation; transfer of detail from single photographs; stereoscopy; displacement in stereoscopic pairs of photographs; stereoscopic transfer of planimetric detail; topographic mapping from aerial photographs). (3) Photo interpretation (techniques and principles of photo interpretation; site; tree species; stand density and crown diameter; tree heights; areas). (4) Forestry applications (forest mapping; indirect measurement of trees and stands; volume estimation from aerial photographs; use of photographs in checking ground inventory; other phases of forest management).

[2337]. 61.32 : 52.4. WODERA, H. Die Holzmassenermittlung nach Luftbildern. [**Determination of timber volume from aerial photographs.**] *Allg. Forst- u. Holzwirts. Ztg.* 59 (13/14; 15/16), 1948 (109–12; 123–6). [G.]

Briefly reviews the history of photogrammetry in Austria and Germany and proceeds to explain methods used to determine stand volume from aerial photographs, viz. (1) Correlations between d.b.h. and maximum crown diameter, and hence, for fairly open stands, use of volume tables based on the latter factor. (2) Correlations between volume and either mean height alone or mean height and crown-area form factor. In both cases corrections must be made for crown closure. (3) Correlations between volume and the product of crown area, mean height and crown-area form factor, with or without correction for age and site quality. In these cases no correction is necessary for crown closure.

Attention is also drawn to the Gauss frequency-distribution curve as modified by Hugershoff, as a means of estimating diameter-class distribution and hence the expected yield by assortments.

[2338]. 61.32 : 61.4. TICHY, A. Jednoduché způsoby vyhodnocování leteckých snímků. [**Simple methods of using aerial photographs.**] *Zpr. výzkum. Úst. lesn. ČSR* No. 1, 1947 (192–206). [Cz.e.russ.] [Stanice lesnické geodesie a fotogrametrie, Brno.]

Notes on the theory and practice of transferring detail from aerial photographs to management maps with the aid of proportional compasses or a pantograph.

[2339]. 61.32 : 12.25–9 : 11.15 : 04.5. BACKSTRÖM, H., and WELANDER, E. En preliminär undersökning rörande möjligheterna att skilja olika trädslag på flygbilder. [**A preliminary investigation of the possibilities of distinguishing different tree species on aerial photographs.**] *Svenska Skogsv-Fören. Tidskr.* 46 (3), 1948 (180–200). 18 refs. [Sw.e.]

At the Institute of Photography of the Swedish College of Technology an investigation has been started to determine, with the aid of a Beckman spectrophotometer, the reflecting capacity of leaves from 19 different tree species in light of wavelengths between 4,000 and 1,000 Å. Diffuse-reflection curves for the various species show a strong resemblance in their general trend, having a low peak in the visible spectrum in the green, where R (reflecting capacity) = 8–12%, and a steep rise at 7,000–7,500 Å. to values of 40–50% in the infra-red. The spectral range important for infra-red photography appears to be 7,500–8,500 Å. Values of R and log R are tabulated for both the infra-red (8,000–9,000 Å.) and green (5,500–5,600 Å.) ranges for each species examined.

From a consideration of the results in relation to photographic contrast (density of negative) it is concluded that hardwoods and conifers will be readily distinguishable in infra-red aerial photographs, whereas contrast between Norway Spruce and Scots Pine will be close to

the limit of distinguishability. In green light (panchromatic film and green filter), in spite of the low reflecting capacity in this range, satisfactory contrast could be obtained between species showing little contrast in infra-red, e.g. Spruce and Pine, Oak and Beech. The practical difficulty is that use of the filter would demand great sensitivity of the film, and it is probably impossible at present to achieve the necessary combination of filter density and film sensitivity. Very valuable work could be done with aerial photographs if it were possible to have regions photographed in both the green and the infra-red ranges. Meanwhile, crown shape will aid in some cases where contrast is poor.

It is intended to measure the reflecting capacity of the various species throughout the 1948 growing season, and after completing the laboratory work it should be possible to obtain definite answers to various questions by means of aerial photography.

63. ROTATION

[2340]. 63 : 56 : 12.25. ROBERTSON, W. M. **The fallacy of cutting trees before they are mature.** *For. Chron.* 24 (3), 1948 (182–90).

Presents data to show that it is both silviculturally and economically unsound to cut small immature trees. An analysis is made of the periodic growth rate of a typical dominant Balsam Fir and a typical dominant Black Spruce, and the findings are applied to a normal stand table to show the volume that may be reasonably expected to accrue in 10, 20, and 30 years succeeding the sapling stage, under given forest conditions.

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

See also *For. Abstr.* 10 (Nos. 1584, 1648–9, 1818).

[2341]. 64 : 11.49.5 (471) : 12.19.2 : 12.19.3 : 38.62. KELTIKANGAS, V. Ojitettujen soitten viljavuus eli puuntuottokyky metsätyyppiteorian valossa. **[The fertility or timber-producing capacity of drained peatlands in the light of [Cajander's] theory of forest types.]** *Acta for. fenn.* 53 (1), (1945) 1947 (1–237). 175 refs. [Fi.sw.e.]

A critical review, chiefly of Finnish and Swedish work, with main reference to: (1) Cajander's system of forest types and the conditions under which ground-flora communities are a reliable index to site quality. (2) Research on ground-flora types on drained peats, their succession towards types similar to and perhaps identical with Cajander's 'forest types' as regards floristic composition (with special emphasis on Melin's finding that succession on all the poorer oligotrophic bogs of classes III–V converges, if drainage is thorough, to the *Myrtillus* type), and its correlation with the degree of decomposition of the surface peat layers. (3) The use of ground vegetation in assessing the economic prospects of draining peatlands for forestry.

[2342]. 64 : 11.48.2 : 11.41.7 : 12.25. KUŹNIAR, K. Kilka uwag o określaniu zdolności produkcyjnej gleby piaszczystej. **[Notes on the determination of the productive capacity of sandy soils.]** *Sylwan* 92 [*n.s.* 2] (1), 1948 (33–40). [Pol.e.]

A soil survey of a forest of about 14,000 ha. carried out by the author, showed the existence of a correlation between the site quality of Pine stands and the proportion of particles smaller than 0·25 mm. contained in the soil. On this basis he recommends a simple method (which he describes) of estimating the quality of a diluvial sandy soil having a water table lower than 2 m., by the proportion of such particles. A proportion above 40% indicates that a soil can be expected to support first-quality Pine, a fact which has been confirmed by Albert's as well as by the author's previous work. Though the proportion of particles smaller than 0·25 mm. is not the only factor on which the height of a stand depends, it is believed by the author to be a sufficiently reliable criterion of quality for management purposes. He makes it clear that this method is not suitable for estimating the quality of soils with a higher ground-water level, much humus, and a profile showing great variations in the proportion of particles smaller than 0·25 mm. On the other hand, quite satisfactory results can be expected on large areas relatively uniform as to ground-water level and the proportion of such particles. The method described has been found by Prof. Mieczynski (Poland) to be applicable for estimating the quality of Oak and Silver Fir soils.

[2343]. 64 : 12.26–8 : 56 : 21.31 : 43.11. STOECKELER, J. H. **The growth of Quaking Aspen as affected by soil properties and fire.** *J. For.* 46 (10), 1948 (727–37). 17 refs.

A study conducted on 30 sample plots in Wisconsin and Minnesota in order to determine some of the factors affecting site quality and increment of Quaking Aspen (*Populus tremuloides*), gave the following results: (1) Site index of Aspen is affected by texture of the soil in the A and B horizons. Optimum texture is about 50% of silt-plus-clay. Very sandy and heavy soils are alike unfavourable. (2) Repeated burnings reduce the site index (expressed as the height of average dominant trees in 50-year-old stands) by 6–25 ft. (3) Big-tooth Aspen (*P. grandidentata*) is less exigent than *P. tremuloides* as regards the minimum % of silt-plus-clay necessary for the production of merchantable material. (4) Former cover is shown to be a fairly reliable gauge for site-index prediction for Aspen. Sites formerly supporting Red Pine did not generally produce merchantable Aspen, White Pine sites were intermediate, and former hardwood sites were best for Aspen. (5) Permanent water tables at 3–7 ft. below the surface of light sandy soils added about 15 ft. to the site index. (6) The height of bracken [*Pteridium aquilinum*] was found to be a fairly good indicator of site quality for Aspen. Where bracken is only 1–2 ft. high it indicates that the soil moisture is too low for good growth; heights of 2½–3 ft. indicate medium, and 3 ft. or more good Aspen sites.

65. DESCRIPTION OF GROWING STOCK

See also *For. Abstr.* 10 (Nos. 1655, 1762, 1819).

[2344]. 65.3 : 12.25. **Tree grades for Loblolly and Shortleaf Pine.** *Tech. Note Stheast. For. Exp. Sta.* No. 69, 1948. pp. 13.

The following 4 tree classes are readily distinguished in the field:—(1) Butt log grade 1 and 2nd log grade 2 or better, (2) Butt log grade 1 and 2nd log grade 3, (3) Butt log grade 2, (4) Butt log grade 3.

The grades are an adaptation of the Crossett Log Grades, which are based on the number and size of knots found on 3 sides of the fallen log or standing tree.

[2345]. 65.7. MITCHELL, H. C. **A basis for the scientific management of farm woodlands.** *Oklahoma Crops and Soils 1947*, 1948 (75–8).

The author propounds the principle that with the Oak/Hickory/Yellow Pine type of the southeastern United States, dominant trees of the same diameter require the same minimum crown space ($(D + 4)^2$ sq. ft., where D = d.b.h. in inches) regardless of species, age, or site. He demonstrates this by plotting (1) a curve derived from the formula that the number of dominant trees per acre at any given diameter

$$= \frac{43{,}560}{(D + 4\text{ ft})^2}$$

and (2) data derived from 700 sample plots, showing number of dominant trees per acre by average d.b.h. for Loblolly and Shortleaf Pine and upland Oak respectively in Eastern Oklahoma, on (*a*) best, (*b*) poorest sites. The curve shows a striking coincidence with the sample-plot data. Practical applications of this principle are indicated.

66. YIELD REGULATION. SUSTAINED YIELD

[2346]. 66 (471) : 09.1. LIHTONEN, V. Piirteitä metsätalouden järjestelyn rakennemuodoista Suomessa. **[On the 'structural forms' of forest management [i.e. methods of yield regulation] in Finland.]** *Acta for. fenn.* 52 (4), (1944) 1947 (1–154). 93 refs. [Fi.g.]

A historical survey.

[2347]. 66 (471) : 09.4 : 90. LIHTONEN, V. Valtakunnan metsätalouden järjestely metsiemme poistuman ja tuottohakkausmäärän valossa. **[Regulation of Finnish forestry in relation to total drain and calculated annual yield.]** *Acta for. fenn.* 53 (3), (1946) 1947 (1–131). 15 refs. [Fi.e.]

Considers in detail statistics of total drain, cutting and increment, arranged by regions and ownership groups, for the period 1935–45, concluding that at its end the accumulated excess increment amounted to 77·5 million cu.m. under bark (24·4 in private and communal forests, 14·5 in company forests, and 38·6 in State forests). Undercutting had been general in the State forests, but in the other categories local overcutting had taken place. These differences are due in the main to differences in accessibility.

Calculations are made of the annual yield, using the author's own method [see *For. Abstr.* 8 (No. 2815)], for the two periods 1938–47 and 1948–57. For the first period the yield is calculated as about 33 million cu.m. For the second, the cut should be 34·5 million cu.m., with proper adjustments in the quotas to be observed for different regions and ownership groups. The last problem is discussed in detail, with special reference to the need for greatly extended transport facilities, the greatest factor in the problem. For the next few years it will not be possible to keep fellings to the calculated yield, and the increment accumulated during the war will have to be utilized.

[2348]. 66 : 12.26–8 : 22.6 : 56.3 : 57. SAHAI, R. **Use of enumeration data and yield tables to calculate the C.A.I. of a forest with a view to fix its yield.** *Indian For.* 74 (1), 1948 (13–15).

A method of calculating the yield, with the help of partial enumeration data, for Sal [*Shorea robusta*] conversion forests is outlined and illustrated. The method is also applicable to selection forests.

67. WORKING PLANS

[2349]. 67. WACHTEL, H. Die Waldkartei. **[The forest card catalogue.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (9/10), 1948 (68–9). [G.]

Proposes that working-plan data which are frequently used should be kept in card form, with a card for each unit of management. Cards would be gathered into fascicles in special wrappers bearing summary data for the major subdivision represented. Duplicate cards could be made available for local use in the field. Any changes could be entered currently on such cards and the task of revision at the end of a period would be facilitated.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

74. VALUE OF THE STAND. VALUE OF THE FOREST

[2350]. 74 (494). RÜEDI, K. Aus der Praxis der Waldwertrechnung. **[A practical case of forest valuation.]** *Schweiz. Z. Forstw.* 99 (5), 1948 (270–7). [G.f.]

Details the procedure followed in valuing forest expropriated to provide a site for the Kloten airport, Canton of Zürich.

[2351]. 74 : 22.15. GEVORKIANTZ, S. R., KILP, F. G., DOSEN, R. C., and SCHMIDT, O. A. **A method of evaluating land for pulpwood production.** *J. For.* 46 (9), 1948 (674–8).

Describes the valuation method devised by the Lake States Forest Experiment Station in co-operation with the Nekoosa-Edwards paper company, and used in purchasing land which now supports trees below merchantable size. An example of the application of the method is given.

[2352]. 74 : 22.21. RIEBEL, F. Bodenwert und Rentabilität des Mittelwaldes. [**[Calculation of] soil value and profitability of coppice with standards.]** *Allg. Forst- u. Holzwirts. Ztg.* 59 (19/20), 1948 (155). [G.]

76. MANAGEMENT STATISTICS

See also *For. Abstr.* 10 (Nos. 1757–9, 1761, 1820, 1933–4, 1973, 2209).

[2253]. 76.1 : 84 : 02.1 : 32 : 33. RAZOUS, P. La comptabilité de rendement dans les exploitations forestières, les scieries, et les industries du bois. **[Cost accounting in forest operations, sawmills, and woodworking industries.]** Dunod, 92 Rue Bonaparte, Paris 6. 1948. pp. 112. [F.] Price Fr. 210 (7*s.* 6*d.*).

[2354]. 76.3 : 01.4. KRENN, K. Neue Wege zur Erfolgsrechnung. **[New ways of calculating the financial yield.]** *Schr-Reihe bad. forstl. VersAnst.* No. 2, 1946. pp. 25. [G.g.]

The new method proposed, which is worked out on the basis of a complete felling series of Norway Spruce, involves the following main steps:—(1) Total yield for the appropriate site quality and rotation is taken from a yield table. (2) Values are determined, and are presented in a table and graph, for outturn of felled timber, mean d.b.h. over bark (*a*) and its standard

deviation (σ), as related to total yields of between 650 and 1,350 cu.m./ha. (3) Prices for individual assortments of timber are expressed as functions of d.b.h. over bark (and simultaneously of mid-diameter under bark) in a smoothed graph. To the same graph are added felling costs expressed on the same basis. (4) From the graph mentioned at (2) are found the d.b.h. of the two Hohenadl mean trees ($a - \sigma$; $a + \sigma$), for each of which the curves at (3) will indicate prices and felling costs of the outturn. The figures so obtained are averaged for the two mean trees to give the gross value of the outturn and the corresponding felling costs. (5) The net financial yield may now be determined as Gross Value of Outturn *minus* Felling Costs *minus* Silvicultural and Administrative Costs (which will vary from place to place and must be calculated in accordance with local conditions). The figure obtained will represent the net financial yield, assuming 100% timber utilization, either per ha. for the whole rotation or per year for as many ha. as there are years in the rotation.

9. FOREST POLICY

[2355]. 9 : 06.2. **Report of the third session of the Conference, held at Geneva, Switzerland, 25 August–11 September 1947.** Food and Agriculture Organization of the United Nations, Washington. 1947. pp. vi + 81.

The conference made the following recommendations:—(1) That a liaison office be established at Geneva which will be able to give to the secretariat of the ECE (Economic Commission for Europe) the technical assistance recommended by the Marianske Lazne Conference [cf. *For. Abstr.* 9 (No. 1964)]. (2) That the Director-General make suitable arrangements to ensure that the work of FAO in the field of European forestry and forest products is carried out in close co-operation with ECE and other United Nations bodies and specialized agencies. (3) That the European countries concerned should meet together from time to time within the framework of FAO to exchange information and views about their problems in the field of medium- and long-term forestry. (4) That forestry experts under the auspices of FAO visit all the countries in the Mediterranean area and the Near East which may express interest in a reforestation programme, commencing in Greece, and make recommendations for effective action in those regions. (5) That all governments supply the statistical information concerning forestry and forest products which may be requested, as speedily as possible in order to enable FAO to publish such statistics at the appointed date [cf. *For. Abstr.* 10 (Nos. 1547–8, 1553–4)]. (6) That those countries which have not yet established sub-committees on forestry and forest products as part of their FAO National Committees should do so as soon as possible.

90. GENERAL PRINCIPLES OF FOREST POLICY

See also *For. Abstr.* 10 (Nos. 1543, 1701, 2347).

[2356]. 90 (437). Trančík, P. Pionieri lesníctva. **[Pioneers of forestry.]** *Pol'ana* 3 (4), 1947 (73–4). [Slovak.]

A sketch of the tasks facing foresters in Slovakia as a result of the current process of woodland nationalization, which includes the confiscation of enemy and quisling estates. The late owners had, in general, exploited their forests without regard to the future, and often through contractors, leaving them depleted of the older age classes, ill tended and stocked, and with small attempt at regeneration, whether natural or artificial. Thus in the valuable Oak and Beech areas regeneration is mostly coppice, the few seedlings of these species having been ousted by coppice or Hornbeam. In addition, extraction roads, buildings and plant have all been badly neglected. The foresters engaged in the programme of rehabilitation are reminded that they cannot succeed without the moral support of the people, in whom a forest sense is still seriously lacking, and in whom it is the duty of foresters to instil it.

[2357]. 90 (47). Buchholz, E. La politique forestière de l'Union soviétique. **[The forest policy of the Soviet Union.]** *Schweiz. Z. Forstw.* 99 (6), 1948 (310–4). [F.g.]

[2358]. 90 (669). **Forest administration plan Nigeria 1946–55, under a ten-year plan of development for Nigeria 1946.** Government Printer, Lagos. 1948. pp. 42. 13 tbls. Price 9*d*.

[2359]. 90 (676). HATHORN HALL, J. **Forest policy [of the Government of Uganda].** *Rep. For. Dep. Uganda 1947*, 1948 (45–8).

[2360]. 90 (801). GONGGRYP, J. W. **Outline of a general forest policy for the tropics.** *Unasylva* 2 (1), 1948 (3–7).

Sketches some of the common characteristics of tropical forests with special reference to Latin America.

[2361]. 90 (81) : 3 : 98. **The Southern region of Brazil.** *Unasylva* 2 (3), 1948 (135–7).

A brief account of the present degree of exploitation, with suggestions for measures calculated to increase it.

[2362]. 90 (89) : 81. **Forestry plan of Uruguay.** *Unasylva* 2 (3), 1948 (132–5).

Gives some account of the different bodies at present responsible for, or interested in forestry in Uruguay, and sketches a programme of work for a proposed Forest Department.

91. SOCIAL AND ECONOMIC INFLUENCE OF THE FOREST. NATIONAL PARKS. RESERVES. FOREST INFLUENCES

See also *For. Abstr.* 10
(Nos. 1536, 1559, 1588–9).

91.4. *The Forest in Hygiene and Recreation*

See also *For. Abstr.* 10
(Nos. 1589, 1715, 1807).

[2363]. 91.4 (492). WECHEL, A. TE. De materiele betekenis van het bos als recreatieoord. **[The material significance of the forest as a place of recreation.]** *Ned. Boschb.-Tijdschr.* 20 (3), 1948 (63–6). [Du.]

Estimates that the money spent by holiday-makers in the forested portions of Holland may amount to about 10 million guilders, or roughly as much as the gross sale value of the country's fellings for the felling season 1946–7.

91.5. *Value of the Forest for Colonization*

[2364]. 91.5 (471) : 92 : 94.3. Kolonisation i Finland enligt jordanskaffningslagen. **[Colonization in Finland under the land-acquisition law.]** *Svenska SkogsvFören. Tidskr.* 46 (4), 1948 (286–8). [Sw.]

Cf. *For. Abstr.* 7 (No. 2177). The present paper tabulates data on progress under the heads: method of land acquisition, past ownership of land acquired, types of small-holding created, persons to whom land has been allotted, and total number of small-holdings eventually required. So far, 1,252,151 ha. have been formed into 79,090 holdings. The total area eventually required, which will form 161,500 holdings, will be 1,725,000 ha., of which 1,180,000 will be forest.

92. FOREST LAW

See also *For. Abstr.* 10
(Nos. 1544, 1561, 2308, 2364, 2369, 2371).

[2365]. 92 (45) : 81. FAMIGLIETTI, F. Considerazioni sulle norme di attuazione per il ripristino del corpo forestale dello stato. **[The conditions for re-instatement of the State Forest Service.]** *Ital. for. mont.* 3 (5), 1948 (288–308). [It.]

Discusses the legislative decree of 12.3.1948 for the re-instatement and reorganization of the State Forest Service, which also defines the duties of the Service. The decree itself is given in an appendix.

[2366]. 92 (492). BEVERSLUIS, J. R. Kroniek van de wetgeving en andere algemene overheidsmaatregelen alsmede organisatie, in Nederland met betrekking tot het bos en het hout. **[Chronicle of Netherlands legislation and other general government regulations, including organization, with respect to forests and timber.]** *Ned. Boschb.-Tijdschr.* 20 (5), 1948 (139–41). [Du.]

Cf. *For. Abstr.* 9 (No. 2656).

[2367]. 92 (81) : 12.19.2–3. As caatingas não podem ser devastadas. **[The caatingas cannot be destroyed.]** *Bol. Minist. Agric., Rio de J.* 32 (11), 1943 (73–83). [Port.]

Discusses the application of the Forest Law to the state of Sergipe, and defines and considers the status of 'caatinga'—associations of

woody, deciduous species, growing in dry soils, which may include Cactaceae, Bromeliaceae and other xerophytic plants.

[2368]. 92 (82). BENASSI, L. La legge forestale argentina. **[The Argentine forest law.]** *Ital. for. mont.* 3 (3), 1948 (172–6). [It.]

An account of the new forest law recently enacted in Argentina. Forests are classified as follows: (1) protection forests; (2) permanent forests (those forming national, provincial or municipal parks or reserves, or containing species which should be preserved, and including street and other shade trees); (3) experimental forests; (4) 'special' forests (small woodlands connected with agriculture); (5) productive forests, i.e. those that do not come under any of the above categories. Owners or tenants of any woodland of more than 100 ha. must submit a working plan for the approval of the Forest Authority and carry it out, must accept its technical advice on reforestation and may not effect a change in land use without authority. The 'special' forests alone are exempted from these conditions. Everyone engaged in forest exploitation, the timber trade, or the transport of forest products, must be registered as such. An important concession is the exemption of all forest from land tax. The implementation of the law is entrusted to a National Forest Institute under the Ministry of Agriculture.

93. FOREST RIGHTS, CONCESSIONS AND PRIVILEGES

[2369]. 93 (436) : 92. KROCZEK, H. Trennstücke eingefor steter Liegenschaften und ihre Forstrechtsgebühren: eine agrarrechtliche Studie aus der Praxis. **[Fragments of properties subject to forest servitudes and their liabilities in this matter: a study, from practice, in agrarian law.]** *Cbl. ges. Forstw.* 70 (1), 1947 (52–64). [G.]

94. FOREST OWNERSHIP. CO-OPERATIVES

See also *For. Abstr.* 10 (No. 2364).

[2370]. 94.12 (548) : 60.2. NAIR, K. N. R. **The *panchayat* forests of the Madras Presidency and the fuel problem.** *Indian For.* 74 (1), 1948 (11–12).

Urges the necessity for putting the *panchayat* forests under the supervision of the Forest Department in order to ensure the proper management and exclusion of stock which are necessary if they are to discharge their primary function of providing fuel.

[2371]. 94.33 (471) : 94.6 : 92 : 97. HARVE, P. Puunjalostusteollisuutta ja puutavarakauppa harjoittavien yhtiöiden maan hankinta Suomessa. **[Land acquisition by the wood-manufacturing and timber-trading companies in Finland.]** *Acta for. fenn.* 52 (1), 1947 (1–115). 45 refs. [Fi.g.]

A historical study with special reference to the role of such land transfers in rural economy.

[2372]. 94.4 (410). URQUHART, B. **Co-operation in forestry [: advantages resulting from co-operative systems, and progress made in Scotland and England].** *Ctry. Life, Lond.* 103 (2664), 1948 (272–4). O.B.

96. POLICY REGARDING PROTECTION FOREST, DEFORESTATION AND AFFORESTATION

See also *For. Abstr.* 10 (Nos. 1589, 1810).

[2373]. 96 (44) : 83. Le fonds forestier national. **[The national forestry fund.]** *Rev. Eaux For.* 87 (5), 1948 (270–83). [F.]

An account of the French national forest fund, instituted in 1946, and the programme of afforestation and of assistance to private owners, which it is proposed to finance through the fund. During the year 1947, the area replanted by the help of the fund amounted to 72,423 ha., 58 nurseries were established, 7 million plants were raised, and 31 tons of conifer and 200 kg. of hardwood seeds were collected.

[2374]. 96 (485) : 2. LINDQUIST, B. Skogsskötseln och vår virkeshushållning. **[Silviculture and the timber economy of Sweden.]** *Svenska SkogsvFören. Tidskr.* 46 (1), 1948 (1–9). [Sw.]

Discusses the serious situation revealed by the second Forest Survey of Sweden [cf. following abstract] with particular reference to silvicultural needs. Concludes that the present organization of forestry in Sweden is inadequate for the silvicultural tasks which must somehow be performed, and suggests that the

programme should be based on the following proposals: (1) The personnel of the County Forestry Boards to be expanded until it is adequate for proper supervision of the law and capable of advising all forest owners. (2) Associations of small forest owners to be formed on the lines of those in Denmark and Finland. (3) The State to assist in developing tax-free investment funds for silvicultural work. (4) The administrative staff of the State Forest Service to be increased and the area of administrative charges to be decreased. (5) Frequent transfers of forest officers to be avoided. (6) Forest schools to be expanded to meet the above needs. (7) Forestry education to be brought under a single authority. (8) Some forestry work to be introduced into the curriculum for the higher classes in schools, with a view to relieving the labour shortage. (9) Effective organization of plantation work within both the State Forest Service and the Board of Private Forestry. (10) Seed plantations, seed extractories and nurseries to be extended. Seed of certain fast growing species —e.g. Central European *Picea abies*, *Picea sitchensis*, *Larix sibirica*—to be imported under scientific supervision, and large-scale propagation of Poplars undertaken. Duties on seed and plants of important species to be waived.

[2375]. 96 (485) : 2 : 09.4. NÄSLUND, M. Våra skogars tillstånd och medlen till skogsproduktionens höjande. **[The condition of the forests of Sweden and means of increasing forest production.]** *Svenska SkogsvFören. Tidskr.* 46 (2), 1948 (75–91). [Sw.]

Reviews: (1) Changes in growing stock between the first and second Forest Surveys (the latter not yet completed for Central Sweden), with special reference to the dangerous decrease in Norrland [cf. *For. Abstr.* 8 (p. 339); 9 (No. 2021)]; (2) felling programmes which have been proposed to restore the stocking to a proper level [cf. *For. Abstr.* 9 (No. 648)]; (3) area statistics, with particular reference to age classes and area needing regeneration or tending measures; (4) the required plantation and natural regeneration programme [cf. *For. Abstr.* 7 (No. 1722); 9 (No. 1533)] of 98,000 ha. annually for the next 20 years, implying increases of the 1936–9 rate of artificial regeneration by four in S. and central, and by seven in the N. of Sweden; and (5) the need for extended research and education, for proper planning of remedial measures, and for tax-free investment funds to enable private forest owners to finance silvicultural operations.

[2376]. 96.5 (675) : 09.7. GOMEZ, P. Le problème forestier de Haut-Ituri. **[The forest problem of Haut-Ituri.]** *C.R. de la Semaine agricole de Yangambi, I.N.É.A.C.* 1947 (827–49). [F.]

It is concluded that the ambitious programme of afforestation proposed for this region could not be carried out within a reasonable period, even if the expense could be met, and that in a given length of time and for a given cost, 7 times as large an area could be reforested simply by excluding fire and regulating the exploitation of savanna woodland.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 10 (Nos. 1572, 1589, 1805–6, 1811–2, 2144–7, 2371).

[2377]. 97 (494). VITAL, N. Die Land- und Forstwirtschaft in ihren wechselseitigen Beziehungen. **[Agriculture and forestry: their mutual relationships [in Switzerland].]** *Schweiz. Z. Forstw.* 99 (4), 1948 (175–87). [G.f.]

Reviews the present position, in which forestry and agriculture have about equal shares ($\frac{1}{4}$ each) of the total land area, pointing out that whereas the forest area is legally protected, agriculture enjoys no such guarantee and is menaced by the expansion of industrial centres and by the movement of labour into the towns. Argues that some forest could be sacrificed to agriculture, that some relief would be afforded by consolidation of scattered holdings and the improvement of alpine husbandry, and that closer collaboration is necessary between the forester and the agriculturist in the interests of proper land use.

[2378]. 97.1 (54). HAMILTON, A. P. F. **The problem of shifting cultivation.** *Indian For.* 74 (1), 1948 (2–6).

Brief notes on attempts at settling aboriginal tribes in the Eastern States of India to permanent cultivation. **[Cf. *For. Abstr.* 10 (No. 848).]**

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References: 1. *Allgemeine Forst- und Holzwirtschaftliche Zeitung*, Vienna. 2. *American Forests*, Washington. 3. *Australian Timber Journal*, Sydney. 4. *British Columbia Lumberman*, Vancouver. 5. *Bulletin I.A.I.*, Prague. 6. Ceylon: *Report of Conservator of Forests*, Colombo. 7. *Crown Colonist*, London. 8. *Empire Forestry Review*, London. 9. *F.A.O. Programme of Work*. 10. *Foreign Commerce Weekly*, Washington. 11. *Italia forestale e montana*, Florence. 12. *Journal of Forestry*, Washington. 13. *Maderil*. Buenos Aires. 14. *M.L.B. Log*, Amherst, N.S. 15. *Nature*, London. 16. Northern Rhodesia: *Forest Department Annual Report*, Ndola. 17. *Observer*, London. 18. *Pakistan News*, London. 19. *Pappers- och Trävaru-tidskrift för Finland*, Helsingfors. 19a. *Wiadomości i sprawozdania*, Institut Badawczy Leśnictwa, Kraków. 20. South Africa: *Dept. of Forestry Annual Report*, Pretoria. 21. *Southern Lumberman*, Nashville, Tennessee. 22. *Spectator*, London. 23. *Timber Trades Journal*, London. 24. *Timberman*, Portland, Ore. 25. *Unasylva*, Washington. 26. *West Coast Lumberman*, Seattle. 27. *Woodland World*, Montreal.

The numbers in brackets indicate the reference number and date of publication of the periodicals, etc., to which the annotations refer.

Conferences. The following conferences are provisionally arranged for 1949:—

2nd International Congress of Crop Protection, London, July 21–29.
1st International Biochemical Congress, Cambridge, August 19–25.
Specialist Conference on Plants and Animal Nutrition, Australia, August and September.

and the following for 1950:—

4th International Congress of Soil Science, Netherlands, July 24-August 1.
17th International Botanical Conference, Stockholm, date undecided.
Commonwealth Agricultural Bureaux, Review Conference, date undecided.

The programme of symposia organized with the help of Unesco by the International Union of Biological Sciences started in November, 1947, with a symposium on trace elements in plant physiology held at Rothamsted. The second symposium of this series was held during June 14–19, 1948, at Utrecht; it dealt with the theoretical basis of botanical nomenclature and systematics. Reports of these two symposia will be published by the Chronica Botanica Co. A symposium on cytogenetics and genetics was held at Stockholm during July 15–16, 1948, and a report will probably be published as a separate number of *Bibliographia Genetica*. Finally a symposium was held at Stockholm during August 5–7, 1948, which discussed the scientific foundations of an international organization for combating agricultural pests. The report of this meeting will be published by the general secretary of the International Union, Muséum d'histoire naturelle, Paris (**15**; 25.12.48).

The 7th meeting of the Pacific Science Conference, which has been called for February 2nd to 22nd, 1949, in Auckland and Christchurch, New Zealand, will devote one complete session to a symposium on major forest problems of the Pacific (**12**; Dec. 1948).

During the first half of September, 1948, the 6th international conference on photogrammetry was held in Scheveningen; 300 delegates from all parts of the world took part. The U.S.A., Great Britain and the British Dominions presented material on forest photogrammetry. The Austrian and Italian delegates reported on individual experiments in the measurement of volume from air photographs. The next conference will be held in 1952 (**11**; Sept./Oct. 1948).

Africa. The discovery of a new drug, 'Antrycide', showing great promise in comprehensive trials as a trypanocide, has been announced from the Colonial Office. Field trials show that the drug may be safely administered subcutaneously, and single doses have cured infections of *T. congolense*, *T. vivax* and *T. brucei* in cattle, *T. brucei* in horses, donkeys and dogs, and *T. evansi* in camels. 'Antrycide' salts have also been shown to give considerable protection to cattle against subsequent infection with *T. congolense* and *T. vivax*. Experiments are still in progress to determine the duration and the character of this prophylactic action, and to ascertain whether the drug can be used successfully for the protection of cattle maintained in, or transported through, tsetse areas of tropical Africa (**15**; 15.1.49).

Argentina. One of the most important questions to be considered at the second Argentine Forest Products Congress, to be held in Santiago del Estero in October, 1948, will be the problem of producing and marketing fuel from forest products, an industry which, formerly one of the principal activities of a large part of northern and central Argentina, is now completely stagnant (13, Aug. 1948).

Australia. Under the terms of the School Endowment plantation scheme, any school in Victoria may be granted a piece of forest land, the care of which is assumed by the children. There are now 350 such forest stands maintained by 400 schools, most of which are less than 7 acres, though none exceed 46 acres. The school forests are generally plantations of *Pinus radiata* which were established by the schools themselves and which are now being tended by a new generation of schoolchildren. The areas are crown land, land supplied by municipalities, or land purchased by committees of teachers appointed to take care of the stands with the help of regional foresters (25, Sept.-Oct. 1948).

Austria. As there has been open controversy in professional circles on the methods to be used for controlling insect outbreaks, a working party for research on and control of pests has been formed, consisting of both forest administrators and entomologists. The development of the organization and its work is left to its members. Its chief interests for the present will be the recent outbreaks of nun-moth, bark beetles, and Larch tortrix [cf. *For. Abstr.* 10 (Nos. 737–9, 742, 744),] 1; Feb. 1948).

An Austrian society for wood research has been formed, after many years' preparation. Its aim is to integrate all the existing institutions and organizations connected with wood research (25; July/Aug. 1948).

British Guiana. The Colonial Development Corporation has announced its intention to participate in forestry development in British Guiana and has set up an investigating body in association with several commercial undertakings, in order to prepare a plan of operations. The Government of the colony will be invited to nominate a representative on the Board (7; Nov. 1948).

Burma. On the 1st June, 1948, the State assumed control of the extraction of Teak from the forests in Central Burma, about one-third of the total Teak-bearing area. In June, 1949, a further third, and in June, 1950, the balance, will be taken over. Mills will be taken over at the same time, the aim being complete State control of extraction, milling, and marketing. The nationalized industry will be managed by the newly formed State Timber Board, which will control the business as a whole. The Forest Department is represented on the Board by the Chief Conservator of Forests. Burma's Teak output in 1947–8 was about 170,000 round tons, and it is hoped to step this up gradually and attain the pre-war output of 400,000 tons within 5 years (8; Dec. 1948).

Canada. A recent pastoral letter issued by the Bishop of the Gulf of St. Lawrence deals with forests, exhorts people to learn about forestry and eliminate fires caused by carelessness, asks the lumber and pulp companies to plan ahead for permanent industries, and deals at length with the desirability of establishing forest communities. The Bishop also urges the establishment of forestry schools and an adequate road network (27; Aug. 1948).

A newly formed insurance company has recently acquired a Dominion charter to provide fire insurance for standing timber. Data examined by the new company indicate that forest fire damage is on about the same level as that of ordinary fire insurance business or lower. The company expects to maintain substantial reserves and write a large volume of business to provide successful operation. Premium rates will vary with the insurers' level of coverage (14; 5.11.48).

Canadian Industries, Ltd., are planning a new factory at Shauinigan Falls, Quebec, for the manufacture of cellulose sponges from sulphite pulp, caustic soda, hemp and other materials (27; Oct. 1948).

A disease similar to the dieback of Birch has been noted on a number of Maples in the Maritime Provinces, and is being investigated by the Provincial Department of Entomology (27; Dec. 1948).

Research is in progress at the Dominion Forest Products Laboratory, Vancouver, on the extraction of tannin from Hemlock bark, which contains 10–15% of this substance. The first difficulty to be overcome is the removal of salt absorbed by the log during sea rafting (**27**; Dec. 1948).

Ceylon. During the year all areas under the control of the Forest Department were reclassified under one of the following categories:—(1) *Climatic forests*, to be maintained for climatic and scenic purposes and to act as a preventive against soil erosion. These, however, are to be worked over systematically, and material resulting from cultural operations will serve local needs, particularly for firewood. (2) *Domestic forests*, in which the primary object of management is to serve the needs of the immediate locality. (3) *Economic forests*, which include the larger and, generally speaking, less accessible areas, from which (especially the forests of the dry zone) the general needs of the island are to be supplied (**6**; 1947).

Czechoslovakia. Timber output in the provinces of Bohemia and Moravia-Silesia has exceeded the felling plan for 1947–8 by 3·4% and amounts to 6,790,000 cu. m. The total yield includes not only planned fellings but also abnormal fellings made necessary as a result of the previous year's drought. The excess fellings were principally in Pine and Fir, which had suffered most from the drought (**4**; Oct. 1948).

F.A.O. The extent of soil erosion in the world is unknown and for this reason FAO has accepted the co-operation of the Conservation Foundation in undertaking a world-wide survey of incidence of soil erosion, with substantial funds to be granted to FAO by the Foundation. The survey will be made by a careful study of all existing information, including maps and aerial photographs. If important areas are found where no reliable information exists, experts will be sent to ascertain the extent of soil erosion (**9**; 15.11.48).

Finland. A Finnish company has started to use a continuous pulping process. Previously only pilot-plant production had been carried out. Only the sulphate method has been applied, but experiments are also to be made with sulphite cooking. The digester does not need to be emptied and refilled for the following batch; refilling and emptying take place successively during the process, which is not interrupted. Operating costs are considerably reduced. Four mills for the utilization of this method are under construction in Italy, France and Sweden and more are planned (**25**; July/Aug. 1948).

Under the trade agreement between Poland and Finland of March, 1947, 4,000 Finnish prefabricated wooden houses have been delivered to Poland and have now been erected. The houses were put up by skilled workmen, by pupils of industrial trade schools, and by members of the Youth Labour Service, in an average period of 3 days per house (**19**; 30.9.48).

France. *Melampsora pinitorqua* has been detected for the first time on young *Pinus pinaster* in the forests of the Landes. It is proposed to deal with this by eliminating the alternate hosts, White and Aspen Poplars, and to avoid planting them in mixture with *P. pinaster* in future (**25**; July/Aug. 1948).

An entirely new technique has been devised for applying insecticidal or fungicidal dusts, depending on the principle that electrically charged particles in the vicinity of an electrically neutral conductor, will be attracted to the latter owing to displacement of free charges on its surface. Dust particles carrying charges of the same sign also repel each other, thus effecting more uniform dispersal both in the atmosphere and on leaf surfaces. A further advantage is that charged particles are attracted to the lower as well as the upper surface of the leaves. In the apparatus used, an air stream, produced by a fan, picks up the dust and carries it past electric poles or a wire at a tension of 50,000–100,000 volts, which is sufficient to cause partial ionization of the air. Two engineers, Néel and Felici, have succeeded in producing very light apparatus possessing an electrical efficiency of 80%. Their small model weighs 2 kg., has a power consumption of 5 W., and is built into a back-packing apparatus having a hand lever which operates the HT generator and fan. Larger models have also been devised, suitable for use on vehicles. Well known French scientists have taken part in the research leading to the production of these machines. Practical tests have shown excellent results (**1**; Sept. 1948).

Germany. Development of a process for manufacturing high-tenacity rayon from Beech wood pulp will save the rubber tyre industry about 1½ million dollars in imports this year. This rayon, used as fibre in rubber tyres, has undergone exhaustive mechanical and road tests during the past year and has been found superior to the conventional cotton thread used at present. The amount of coal required for the production of the fibre is not excessive, and valuable by-products such as yeast and alcohol are obtained from the pulp (**25**; July Aug. 1948).

Great Britain. A young Lime tree was recently planted ceremoniously at the side of a new County Council smallholding in the Sandy and Biggleswade district of Bedfordshire. It is to be 'a pioneer move to replace Elm trees killed by disease, trees dying from old age, and trees which have been felled indiscriminately'. The species selected for this pioneer estate are Limes (200), Planes (24), Norway Maple (30), Sycamore (50), Horse Chestnut (48), Beech (48), and American Red Oak (48). Elsewhere in the Sandy area, Scotch and Corsican Pines are to be planted in belts as defences against denudation (**22**; 10.12.48).

At the second annual conference of plant breeders held at the John Innes Horticultural Institution, Nov. 11–12, under the auspices of the Agricultural Research Council, the following resolution was carried unanimously:—

'Considering that with the use of modern genetical technique the productivity of the forest trees could be raised in Great Britain by at least 20%; and considering the increasing scarcity of timber in this and other countries and that many other countries (such as Sweden, Denmark, South Africa and the United States) have already established first-class institutes for the study of tree breeding, it is recommended that the Agricultural Research Council should establish a forestry genetics institute for the improvement and acclimatization of forest trees by genetic methods' (**15**; 8.1.49).

Recently the Biological Council, consisting of representatives of 19 different biological societies, was asked by a number of these societies to examine the possibility of forming an Institute of Biology. In a preliminary investigation, the views of a number of representative biologists were obtained, and information was also available from the Institute of Biology recently established in the United States under the auspices of the National Research Council [cf. *For. Abstr.* 9 (p. 262)]. The Biological Council has now decided to conduct a postal ballot of biologists, the distribution of ballot papers being made by the affiliated societies. Biologists are asked to state whether they would support an Institute, and to give the Council their opinions on the formation of such an Institute (**15**; 25.12.48).

Newcastleton Forest, which runs from Liddesdale to the English border and is the first of the new Border forests to be planted by the Forestry Commission, is now producing pitprops, pulpwood and Christmas trees from its first thinnings. Yield in the first year is expected to be about 1,500 tons, and should reach 7,500 tons in 1960 (**23**; 8.1.49).

New insulated railway vans for carrying fresh fish from Penzance to London are under construction at Swindon. They are insulated by the inclusion of 3 in. of Onazote between the inside and outside panels, which are of resin-bonded plywood forming the sides, ends, roof and floor of the van body. Removable slatted wooden mats which are laid over the floor, permit free air circulation round the fish boxes (**23**; 11.12.48).

Hylean Amazon. As a result of a Unesco project, the interested countries have agreed to the establishment of an International Institute of the Hylean Amazon, the vast wooded region of the Amazon River basin, some 7,000,000 sq. km. in area with a population of only about 300,000 Indians outside the few towns on the river bank. In addition to the seat of the Institute at Manaus, it is planned to establish research centres as soon as possible at Archidona (Ecuador), Belem do Para (Brazil), Iquitos (Peru), Riberalta (Bolivia), San Fernando de Atabapo (Venezuela) and Sibundoy (Colombia) (**15**; 1.1.49).

India. Production of Sandalwood oil in Mysore in 1947 amounted to 43,500 lb., derived from 488 tons of wood. The Indian demand for this oil has slackened considerably, because of the decline in soap production owing to an acute shortage of caustic soda. The volume of exports has also been adversely affected by the imposition of import duties throughout the world and the use of synthetic Sandalwood in the U.S.A. (**10**; 9.10.48).

It has been discovered that bogwood, the timber of *Cornus oblonga* Wall., found in the hills of Kashmir, East Punjab, the United Provinces, and Assam, is of great value for making charcoal for gunpowder. The wood weighs about 44 lb. cu. ft. and can also be used for shuttles, pallets, bobbin heads, and mallet heads (**23**; 27.12.48).

Japan. About 7,105,000 acres of forest areas in Japan are in need of reforestation. The latest plan for national forests provides for artificial afforestation of 676,200 acres and aided natural regeneration of 1,462,650 acres during 1948–52. The plan for private forests during the same period calls for artificial reforestation of 3,510,850 acres and aided natural regeneration of 1,335,250 acres (**10**; 29.11.48).

Production of crude Pine oil in Japan was 11,000 kilolitres in 1947, but was expected to increase to 25,000 kl. in 1948. There are 70 refineries with a total refining capacity of 40,000–50,000 kl. About 45% of the total output is processed at 9 large plants which use the oil in manufacturing other products. The smaller plants refine the crude oil to produce turpentine and pitch (**10**; 10.1.49).

Mexico. An ambitious forest programme has been undertaken by the Union de Maderas of Chihuahua, a state of Mexico which possesses nearly 7,000,000 acres of forest, largely composed of Pines. The programme, initiated in January, 1948, includes the organization of an effective fire service, better utilization of logs in the sawmill, and the production of stock for replanting areas where no natural regeneration is likely to occur. Forest nurseries have been established in San Juanito, Madera, and Nuevas Casas Grandes. In 1948, 80 lb. of seed of *Pinus ponderosa* var. *scopulorum* were planted in the 3 nurseries with good results. The nurseries are expected eventually to provide between 4 and 5 million transplants a year. Most of the planting will be done in areas cleared and later abandoned by bush farmers (**26**; Nov. 1948).

New Caledonia. Despite the demand for Niaouli oil, production has been neglected in New Caledonia because of shortage of labour for picking the leaves. Niaouli oil is distilled from the leaves of the Niaouli tree (*Melaleuca viridifolia*), and has properties similar to those of Eucalypt oil. The inland forests of New Caledonia abound in many species of timber, with the Niaouli tree predominating, but exploitation is difficult because of their inaccessibility (**10**; 27.12.48).

New Guinea. An outstanding example of the way in which the native forests are contributing to the rehabilitation of Papua and New Guinea is provided by the Bulolo township. Forests of Hoop and Klinki Pine bordering on the township are being exploited to provide timber for houses and furniture. A sawmill and woodworking plant has been established, and 88 houses were produced last year (**3**; Oct. 1948).

New Zealand. The New Zealand State Forest Service has officially closed to exploitation the resources of far South Westland in the area south of the Cork River, and no licenses will be granted until there is a big improvement in the transport system of the far south. Under present conditions, exploitation is uneconomic (**3**; Sept. 1948).

N. Rhodesia. In the middle of the year, when the dry season had set in, a complete set of vertical air photographs on a scale of 1 : 20,000 was taken of the exploited and unexploited Rhodesian Teak (*Baikiaea plurijuga*) forest, a type which is sharply defined on air photographs. These have proved of great value in defining the precise extent of the forests still to be exploited and it has also been found possible, from enlargements to 1 : 10,000 to obtain a good general idea of the density of stocking (**16**; 1947).

Pakistan. The Government of Pakistan have set up a small Forest Research Organization at Upper Topa near Murree, West Punjab, which will deal with enquiries about identification, seasoning, preservation, impregnation, general properties, and other matters relating to timber. It will also give advice about lay-out of sawmills and other woodworking plants, and supply information on forest botany, mycology and entomology (**18**; 10.12.48).

The new Pakistan Forest College is housed in the military cantonment of Upper Topa, on the side of a steep Pine-clad ridge about 7,000 ft. up, near the forest reserves of Bhurban, Charchan and Patriata, and about 36 miles from Rawalpindi. The teaching staff consists of Muslim officers previously serving in the United Provinces and on the Forest Research Institute staff at Dehra Dun (**8**; Dec. 1948).

The Forest Department of Baluchistan has made a start on a programme of work which includes a substantial increase in the area of state forests, measures for soil conservation and afforestation, the exploitation of dead Juniper for pencil wood and fuel, a survey of *Ephedra* crops, and roadside planting. A forest guard training school has been opened at Ziarat (**18**; 3.12.48).

Poland. The State Forest Service estimates that 400,000 ha. of forest were clear felled and 600,000 ha. heavily overcut during the last war, the total drain being close on 100 million cu. m. or 15 times the pre-war normal. The 1947–9 plan provides for the annual replanting of 50,000 ha. of war and 25,000 ha. of current fellings plus 25,000 ha. of waste land. Plantings in 1947–8 totalled 88,000 ha. Between 1945–6 and 1947–8 new working plans were prepared for 1·7 million ha. It has been decided in 1948 that the 'control method'* will be applied in future to the State forests. The Forest Research Institute claims to have completed successful trials on tapping Spruce and Silver Fir.

The acute post-war shortage of farm horses has compelled the State to undertake 40% of this haulage, in 1948, with departmental teams. Mechanical transport is being developed but meanwhile it is proposed to equip horse-drawn vehicles with pneumatic tyres.

In 1948 'Alpit', a water-resistant bakelite (hot) glue was produced by the Bydgoszcz Plywood factory as a substitute for the pre-war German Tego-film in aircraft and other important structures; all other plywood factories are now to start making it. 'Ibelit', a cold bakelite glue, also a product of Bydgoszcz, is being used at the largest aircraft factory at Mielec in place of the Farbenindustrie's 'Kaurit', following extensive tests (**19a**; No. 52, 1948).

S. Africa. Projects have been established at Kwambonambi to test the effect of early thinning on the excessive cone production in stands of *Pinus palustris* in Zululand, which has been particularly noticeable during the past 2–3 years (**20**; 1947).

Spain. The establishment of a Timber Service in Spain is provided for under a recently promulgated official decree. This body is given power to control all phases of timber distribution from the raw material to the finished product (**10**; 23.10.48).

Surinam. The new plywood plant at Paramaribo, Surinam, which is being installed by the Surinam Wood Co., Ltd., is expected to go into operation in 1948 [cf. *For. Abstr.* 9 (p. 395)]. Baboon (*Virola surinamensis*) is to be the main raw material, and the mill is designed to produce 45 cu. m. of plywood every 24 hours. The Surinam government has granted the company a timber concession amounting to 500,000 ha., of which only 75,000 ha. must be worked at a time (**26**; Nov. 1948).

Trinidad and Tobago. The first shipment of Teak logs was made in 1947, and consisted of 150 cu. ft. exported to Jamaica. New areas of Teak have been planted during recent years at the rate of 500 acres annually. At the end of 1947 the area planted amounted to 6,926 acres, and it is planned to have a total of 27,000 acres under cultivation during the next 40 years. Teak planting, which began in 1913 with seed from Burma, is combined with the growing of hill rice, maize, and other food crops. Trinidad has been the supplier of Teak seed to the Caribbean, Venezuela, Ecuador, and Colombia during the past 10 years. Jamaica and Puerto Rico have been the largest importers of seed (**10**; 9.10.48).

U.S.A. In experiments in the hybridization of Pines at the Institute of Forest Genetics, Placerville, Calif., most success has been obtained in the cross-pollination of the White Pines. A cross between *Pinus strobus* and *P. monticola* has produced a hybrid twice as tall and 3 times as heavy as

* La méthode du contrôle; see Commonwealth Forestry Bureau *Technical Communication* No. 5.

either parent. Should this rate of growth continue, it will be possible to produce merchantable Pine timber within a period of 40–50 years, instead of the present 80–100 years. Similar results are reported from crossing *P. strobus* and *P. monticola* with Himalayan White Pine [*P. wallichiana*?] (**4**; Nov. 1948).

A 15,000-acre tract of the Willamette national forest has been set aside by U.S. Forest Service as an experimental area to study the problems of conversion of virgin forest into managed forest. Data on the effects of logging on run-off will be collected from an area of 5,000 acres adjoining the experimental tract (**4**; Nov. 1948).

The U.S. Forest Service in co-operation with State Highway Departments and the Public Roads Administration is planning a programme of road construction designed to render accessible further areas of the north-western national forests. It is estimated that 11,216 miles of road are needed in the North Pacific region to permit full utilization, administration and protection of the national forests (**26**; Oct. 1948).

The increase in forest fires since the end of the war has caused the U.S. Forest Service to set up a new national Division of Fire Research. Objects of study are likely to be:—the causes of forest fires and their spread; the organization of fire-fighting forces; improvements in methods and equipment for fire fighting and detection; and the use of prescribed burning to eradicate undesirable species and reduce fire hazard in areas heavily overgrown with bush (**21**; 1.11.48).

A new barker, designed to bark logs in the pond, is undergoing tests at St. Helen's, Oregon. The barker is mounted on a frame secured to a float and the control panel is on another float directly opposite the cutter head, which is suspended on beam arms and hooded on top and at the side. Separate assemblies are used for log turners. Bark from the logs is picked up in a large tank underneath the barker (**24**; Dec. 1948).

The International Paper Co. is planning to build a new plant in the southern states to produce 300 tons a day of dissolving wood pulp, the principal raw material for rayon and cellophane. Dissolving pulps have hitherto usually been made by cooking softwoods with acid. International's new process will use hardwoods and the alkaline or sulphate process now used to produce kraft paper. New features of the process are purification and bleaching, which produce a raw material particularly suitable for high-strength rayon yarns (**14**; 1.12.48).

Biochemists at the University of Wisconsin have discovered a method of using sulphite waste in the manufacture of lactic acid. Excess sulphur is removed from paper-mill waste by treating it with steam. Malt sprouts, blackstrap molasses, and lactic acid can be recovered from fermented material by using solvents. One advantage of the new process is that 95% of fermentable sugars in the waste are recovered in lactic acid, whereas other methods recover only about 50% (**25**; July/Aug. 1948).

U.S.S.R. A grandiose operation to combat drought in the steppe lands of the black-earth zone of Central Russia and to bring into full cultivation the immense plains of the arid steppe running down to the Caspian Sea was announced on October 24 in a joint Ministerial and Party decree. The most spectacular aspect of the campaign is the planting of narrow forest strips on either side of the great rivers (Volga, Ural, Don, Khoper, etc.) as they run through the treeless plain. In the course of the next 15 years, strips 60 m. wide are to be planted along nearly 5,000 miles of river, and in addition to these, some 750,000 acres of the sandy steppe below the black-earth zone are to be planted by 1954. Even more important than the tree planting is the introduction of a kind of ley rotation to consolidate and enrich the soil and check the course of erosion in those vast, empty, windswept spaces (**17**; 28.11.48).

In 1946 the Soviet Government issued a law for the formation of a water-conservation zone. This zone of 70 million ha. includes the river plains of the Volga, Don, Dnieper, Ural, Dvina, and all their tributaries. The felling of trees was forbidden in zones from 4 to 20 km. wide on both banks of the rivers. This conservation zone must be 20 km. wide in the headwaters, 6 km. in the middle reaches, and 4 km. in the lower reaches of a river. Within this zone only necessary thinning and the removal of dead and dying trees are allowed. As a result of this law, timber production in the Ukraine has dropped from 7½ million cu. m. in 1946 to 2½ million cu. ft. The new 5-year plan 1946–50, envisaged afforestation of 1,200,000 ha. in regions threatened by drought, such as Stalingrad,

Rostov, the Turkmen republic, Kazakhstan and Uzbekistan. The afforestation of the Don basin continues, and 400 ha. have recently been planted to prevent the flooding of the northern Don. Newly introduced species in this area are Siberian Larch, Red Oak, Manchurian Nut and Canadian Poplar (**5**; Oct. 1948).

The Council of Ministers of the U.S.S.R. and the Central Committee of the Communist Party have issued a decree on planting forest belts for the protection of fields against drought, the introduction of temporary leys and the construction of lakes and dams, in order to obtain high permanent yields in the steppe and forest-steppe regions of the European part of the U.S.S.R. The main features of the new farming system will be:

(1) The establishment of a system of state forest belts as protection against drought. For this purpose steps are to be taken to preserve existing forest stands and to plant forests in certain regions, under supervision of 3 territorial administrations and the *Agrolesproyekt* (a research institute).

(2) The establishment of field shelterbelts on collective and State farms.

(3) Fixation and afforestation of shifting sands. For this purpose, various species of trees, shrubs, and grasses are recommended. The Ministry of Forestry will afforest or otherwise fix an area of 322,000 ha. of such sands.

(4) The growing of planting stock on collective farms, State farms, and State nurseries. State farms are recommended to set aside the most suitable fields for nurseries and to employ trained staff to work in them. The Ministry of Agriculture will set up agricultural machinery stations which will carry out ploughing and other operations in the farm nurseries. Measures are also being taken to ensure the supply of seed for these nurseries.

(5) The introduction of temporary leys in crop rotations.

(6) Construction of lakes and reservoirs on the rivers. These will be used for water regulation, irrigation, and fish breeding, and possibly as sources of electricity for the collective and State farms.

(7) The mechanization of operations connected with the planting of forests. It is proposed to set up 570 protective forestry stations during the period 1949–51. It will be their task, in agreement with the collective farms, to prepare the soil, plant seedlings, cultivate the forest belts, and construct lakes and reservoirs. The standard types of machines to be used are specified in the decree.

(8) A central administration of the Council of Ministers is set up to direct these operations; its directives are binding for all ministries and all other authorities (**5**; Nov./Dec. 1948).

For the purposes of the above scheme, a standard tree-planting machine 'PC–2' is being mass-produced. This machine is said to be extremely efficient and of a design so simple that no difficulties will be experienced with repairs. The performance of 'PC–2' is 5 ha./shift, and it will plant either cuttings or seedlings. A number of machines can be used coupled together and pulled by a large caterpillar tractor. A more complicated machine, the 'PN–5' is designed to plant standard seedlings. Tests were recently made of several cultivators for the cultivation of newly planted trees and the 'KLTC–6' was adjudged the most successful. A special tractor designed to move between rows without damaging the tops of young trees is in production. Another tractor, the 'STZ-NATI' has an attachment for digging planting holes (**5**; Nov./Dec. 1948).

Zanzibar. Arrangements are being made for the acquisition by the Government of the Jozani forest in southern Zanzibar. Most of the valuable trees have been cut, and the Government will now reafforest this very fertile area. A temporary Forest Officer has been appointed (**7**; Nov. 1948).